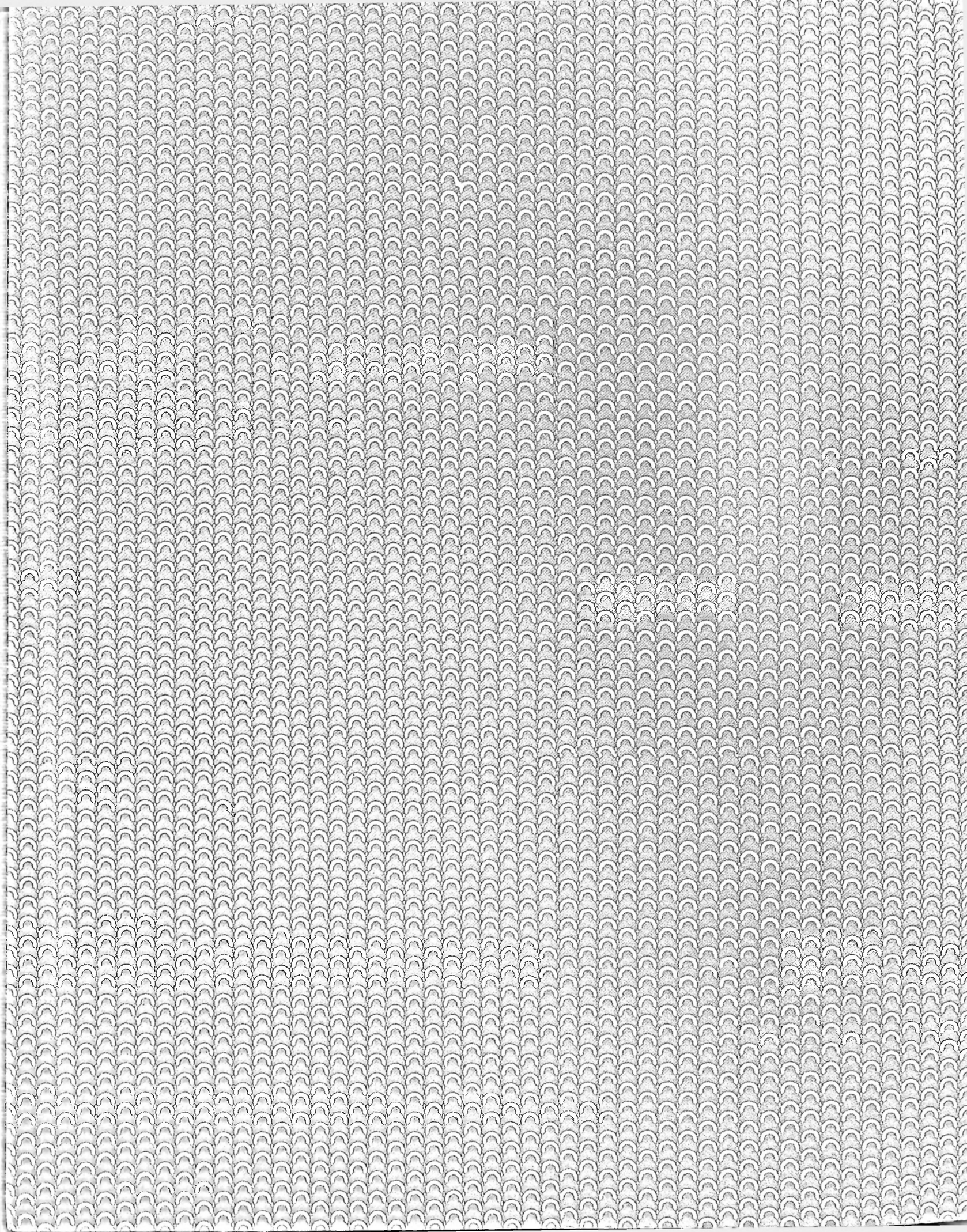
Self-Help Devices for the Physically Disabled

Japan Sun Information Center



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Activities of Daily Living: New Horizons through Devices

THE QUADRIPLEGIC

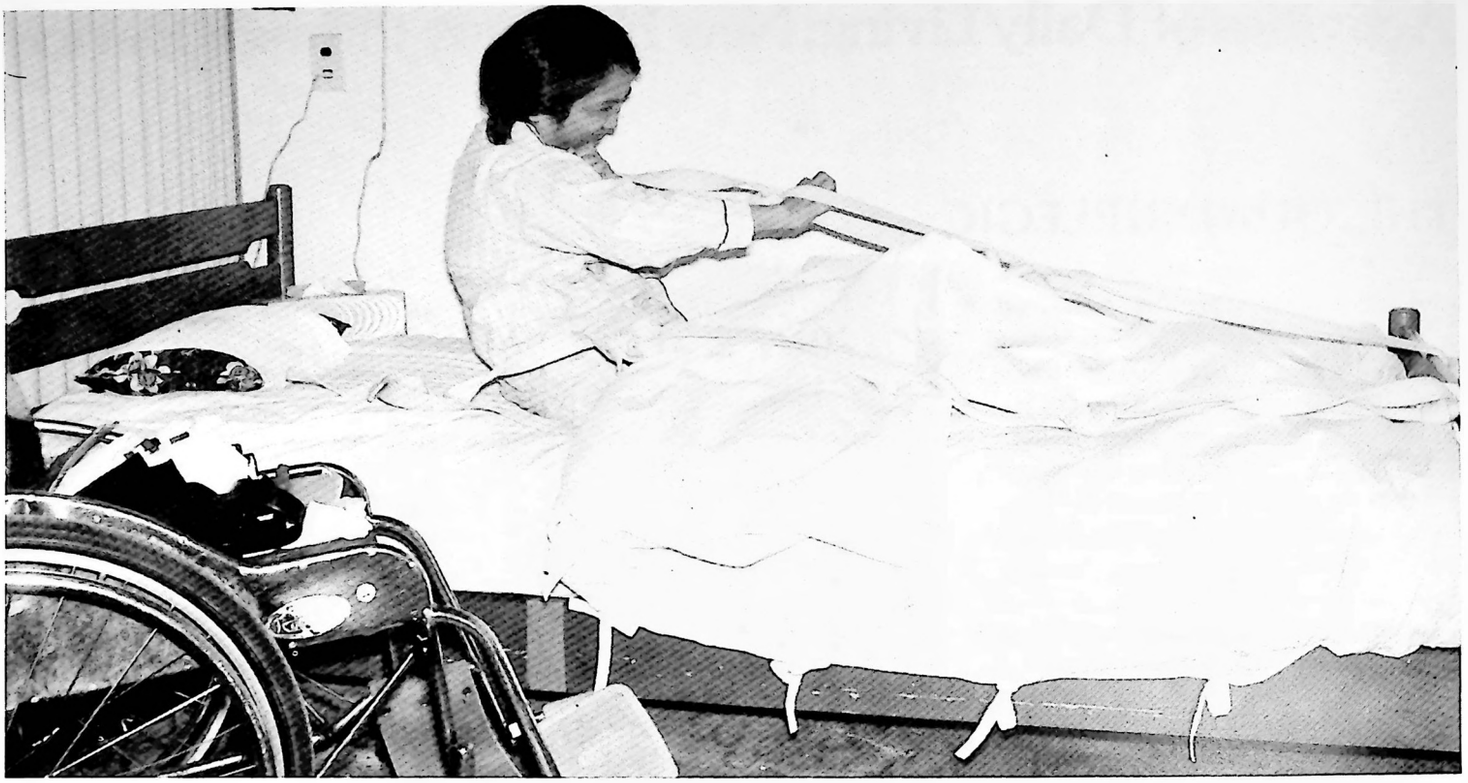
Mr. M. Era, age 24, fell from a roof he was painting. He sustained a C-6 spinal cord injury, resulting in quadriplegia. After some treatment at a general hospital in Tokyo, he entered the Tokyo Metropolitan Rehabilitation Center, where he received training in the activities of daily living (ADL) and functional and prevocational occupational therapy for fourteen months. He is now working for a sheltered workshop which deals with various kinds of printing.

A description of Mr. Era's experiences at the Center provides an explanation of some of the devices for quadriplegics, as well as some insights and ideas for the normalization of their daily lives.

Devices for quadriplegia have been selected through long-term experience in terms of their physical function, practicality, and potential for ongoing improvement. When well-fitted, they become indispensable to the daily life of the disabled person. Before obtaining any of the devices on the market however, it is essential that they be checked for their suitability for the specific purpose intended, and for the degree of difficulty of usage. In some cases, preparatory training may be necessary before the devices can be useful daily aids.

Quadriplegics now use such devices as reachers, cuffs, special trousers and undershorts, urine bags, suppositories, modified telephones, ropes to aid in sitting up, and others. Not only have these devices become indispensable to the lives of patients, they have helped them to become more independent as well.

Among quadriplegic patients there are some victims of cerebral palsy (CP) so severe that they cannot make any voluntary movements. Often the nature of the involuntary movements makes the diagnosis of their general physical condition difficult. Therefore, it is necessary for these CP persons to think out their activities in terms of the use and control of their involuntary movements. The devices to help them achieve this must be simple and durable, especially at the beginning, when they generally have the most difficulty.



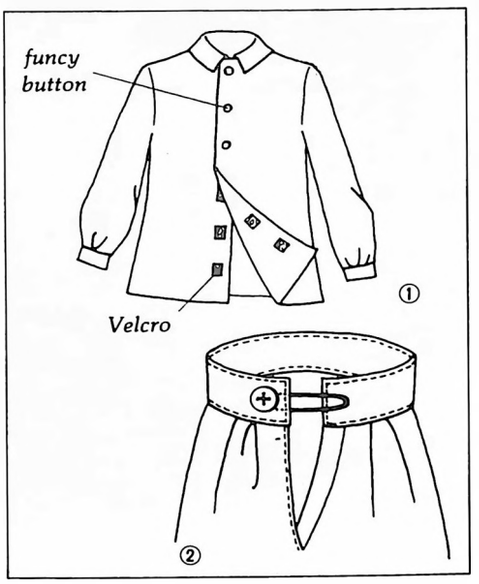
SITTING UP AND CHANGING CLOTHES IN BED

A person with muscle weakness of the trunk and extremities uses a rope with loops in it as an aid to sitting up or turning over in bed. One end of the rope is tied to the foot of the bed. The person sits up by holding a loop with both hands. If he cannot remain in a sitting position unaided, he can do so with the help of a loop placed around his neck or trunk.

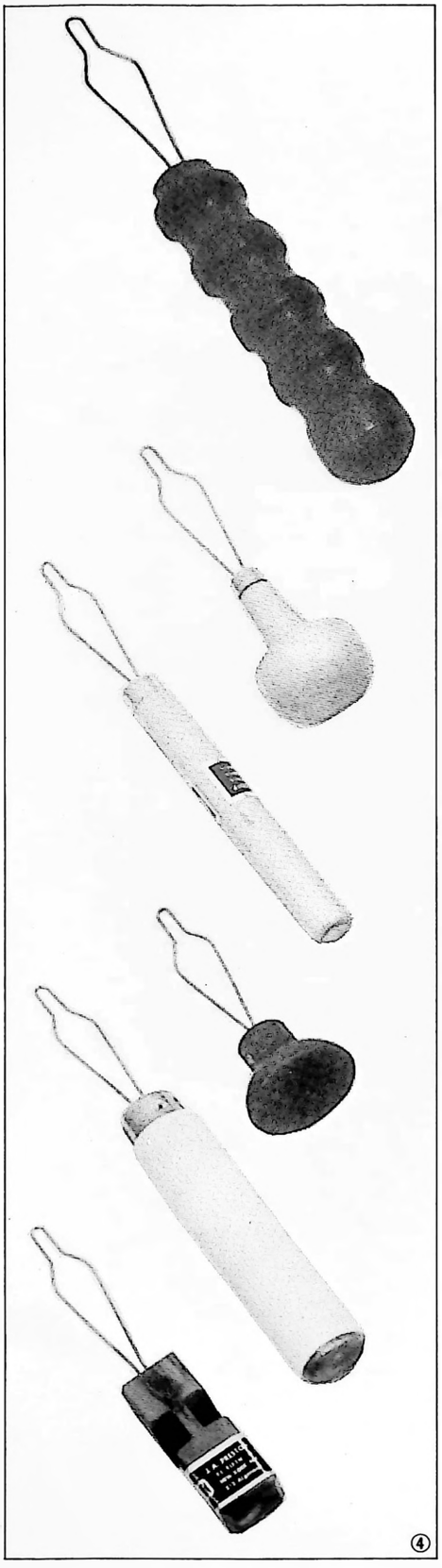
In the case of difficulty in buttoning or unbuttoning clothing, a button hook is used. This device has a big handle which can be grasped easily. The point is inserted through the buttonhole and hooked onto the button. Then it is pulled back through the hole and off the button, which is now in place. For unbuttoning, the procedure is reversed.

In cases where it is difficult to use the button aids, Velcro is used in place of buttons. When washing clothing containing Velcro, it should first be fastened by pressing together or by simple stitching (*Figure 1*).

Cuffs are buttoned with a button hook device (*Figure 3*). If this is not available, a ring of elastic thread is used for fastening the cuffs (*Figure 2*).

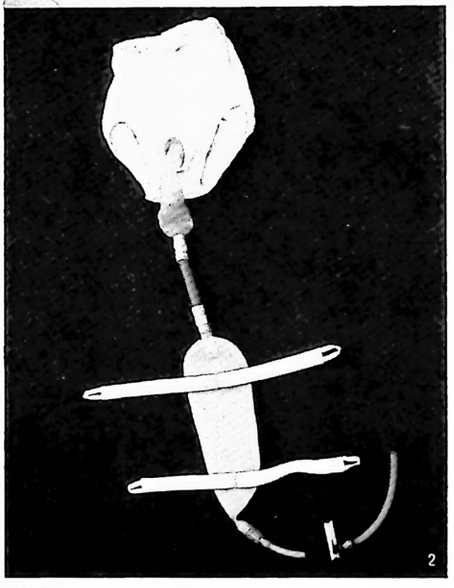


There are several types of handles available for the button hook device. The user can select the one most suitable to his or her grasp (*Figure 4*).



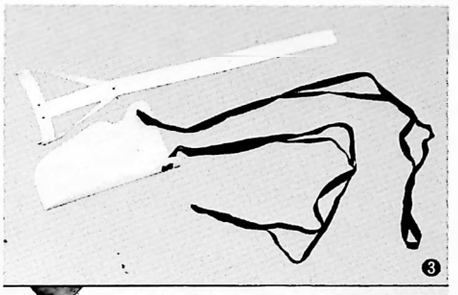
A urinal bag is used for urinating, especially by the bedridden. A man is using a urinal bag of the shorts type (*Photo 1*). The pair of shorts and the bag are connected by a rubber tube. After he puts on the shorts, the bag is attached to his leg with two belts fastened with Velcro (*Photo 2*).

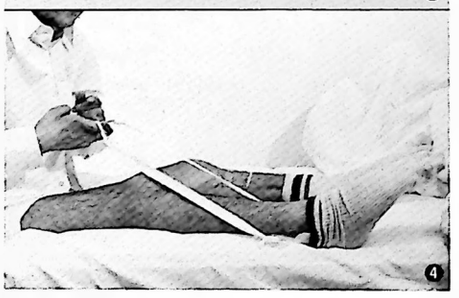
A description of the urinal bag is provided from the paper entitled "New Panty Type Urinal Kit" by Etsuko Ueki and Mitsuko Matsumoto.



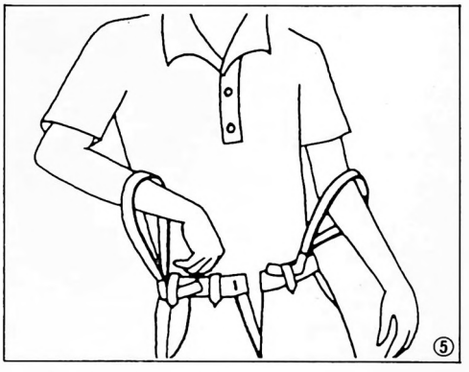
Many types of conventional urinals are on sale in contemporary markets, and some sort of special urine collecting kits have been devised at hospitals. Although they have their own respective advantages for the disabled with neurogenic bladders, several apparent disadvantages or inconveniences for practical use still remain. The authors have devised a new type of urinal to overcome the problems encountered with these conventional urinals.

Stocking aids called "Sock Cones" are used to put on stockings or socks. The socks are set on the Sock Cones, the feet are placed in the socks, and the Sock Cone tapes are pulled until the socks are completely on the feet (*Photos, 3, 4*).





Trousers are put on with the aid of belt loops. One side of the trousers are pulled up while turning over in bed. The upper right and left sides of the trousers each have a loop, and the trousers can be put on by pulling on the loops (*Figure 5*).



The hook and buttons at the waist of the trousers should be replaced by Velcro (*Photo 5*). A ring is fitted at the end of the zipper tab, and pulled up or down with a finger or zipper aid (*Photo 6*). Pockets on the rear of the trousers should be removed in order to prevent bedsores. It is important that no clothing seams or articles in the pockets be allowed to put direct pressure on the skin of the bedridden.

NEW PANTY TYPE URINAL KIT

MATERIALS

The parts necessary to assemble into the kit:

1. Panty for female
2. Tube type rubber penile container having several shallow folds similar to bellows (*diameter of the proximal hole is 35mm*)
3. Proximal amber rubber tube (*the inside diameter is 8mm and the length is 25cm*)
4. Another distal rubber tube (*the inside diameter is 6mm and the length is 30cm*)
5. Urine collecting bag
6. Hard plastic ring (*the inside diameter is 40mm, the outside diameter is 45mm, the outside diameter at each hem is 48mm and the height is 20mm*)
7. Condom
8. Plastic clamp
9. Biased woven tape
10. Rubber string
11. Vinyl tape
12. Three pairs of plastic connection tubes with screw inside

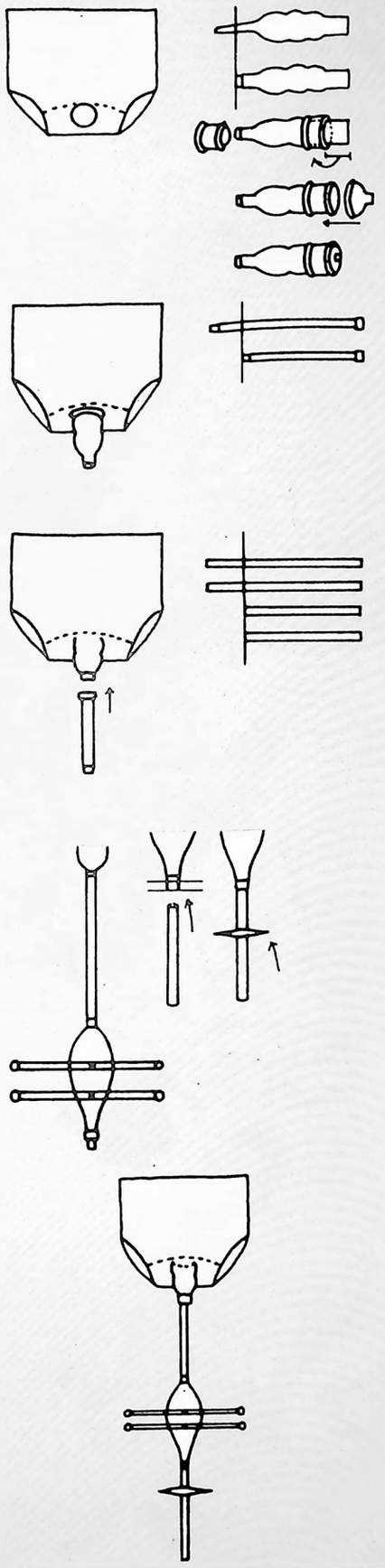
PROCEDURE

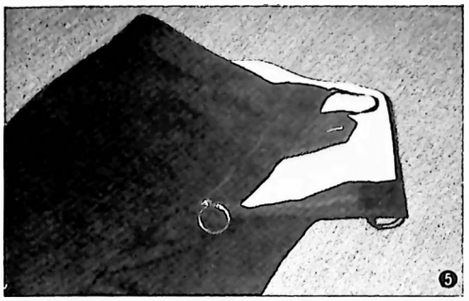
1. Cut and make a hole in a panty, accurately just as wide as the inside area of the plastic ring with a diameter of 40 mm at the place just below the front seam.
2. Stitch the bias tape around the fringe and fix it firmly to the panty.
3. Make the rubber string run through the stitched bias tape around the fringe.
4. Tube part of the rubber penile container is to be made 30 mm long at the distal end, and set the plastic connection screw tube.
5. Turn back the rubber penile container from inside of the ring and fix to the outside of the plastic ring.
6. Cut the tip of the prominent part of the condom to the proper dimension depending on each client's size. Then turn back the condom from inside of the ring and fix to the plastic ring on the penile container.
7. Fix the above described component tightly to the cut fringe of the hole of the panty.
8. Cut the proximal rubber tube to the exact length of the client's upper thigh in order to avoid instability of the tube during his routine movement, and set the connection plastic screw tube.
9. Connect the urine-collecting bag to the above rubber tube with connection plastic tube.
10. Cut the urine-collecting bag's fixing belt with Velcro fastener to the proper length.
11. Bias tape ring for the disabled fingers can be set to the four ends of the urine container belt.
12. Connect the urine-collecting bag to the proximal tube.
13. Connect the distal tube to the collecting bag.
14. Roll vinyl tape to the tube just described above at 5 cm under the plastic connection tube.
15. Set the plastic clamp over the taped rubber tube.
16. Ring for the disabled fingers can be set at upper part of the back of the panty. The assembled kit is now ready for use.

RESULT

A C-6 spinal cord injured man with only C-7 ability (presented by the triceps strength with poor level on the MMT) achieved putting on and taking off the panty type urinal kit independently. He is able to connect and disconnect every junction of the assembly and empty the urine bag and perform all other actions to handle this type of urinal kit with tenodesis action of his wrists. The basic position to put on and take off the panty type urinal kit for him is supine.

Spinal cord-injured have improved their urinary problems remarkably with this kit. Some of them do not need hooks for assistance and use tenodesis motion only. More than fifty lower spinal cord-injured people use this kit, changing willingly from conventional ones.



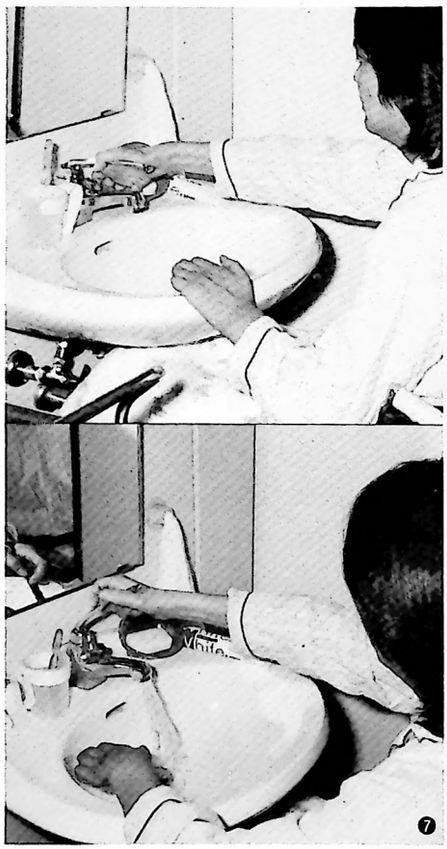


When he is ready to get off the bed, the person shifts himself from bed to wheelchair by supporting himself with his arms. If it is difficult for him to do this, a board with a smooth surface is placed between the bed and the wheelchair, and he inches his way down the board to the wheelchair.

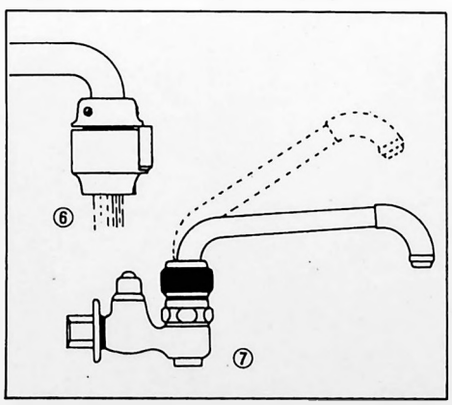
There is a snap-on tie with a fitting pin which is easily put on by hanging the pin on the front of the shirt, and removed by lifting it off. Other types of neckties have a rubber tape or Velcro in place of a fitting pin.

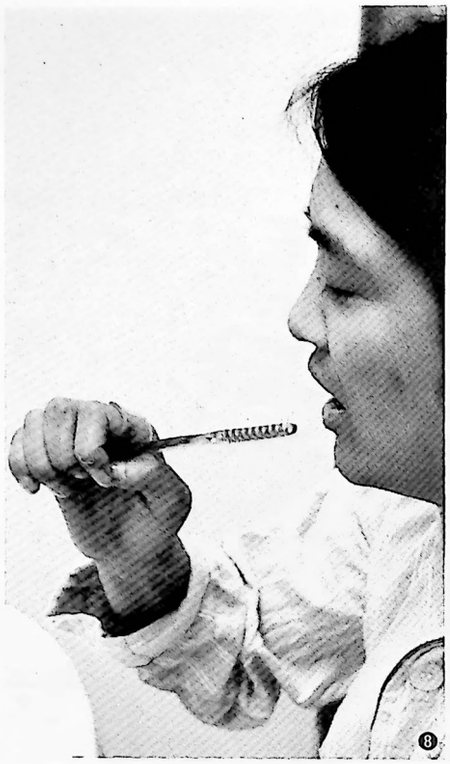
GROOMING WITH A HOLDER

The height of the washstand should be the same as the height of the wheelchair. A shallow washbowl is preferable so that the legs can easily fit underneath. The mirror above the sink is hung so that the full figure can be reflected.

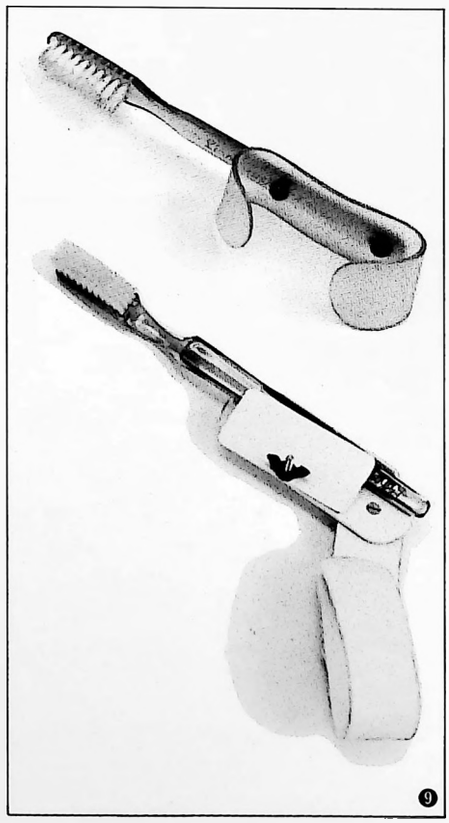


The water tap can be turned on or off by moving a long tap lever up or down *(Photo 7)*. Other types of single-touch taps are the elite-cock (*Figure 7*) with an up and down system, and the free-cock (*Figure 6*) with a pushing system.

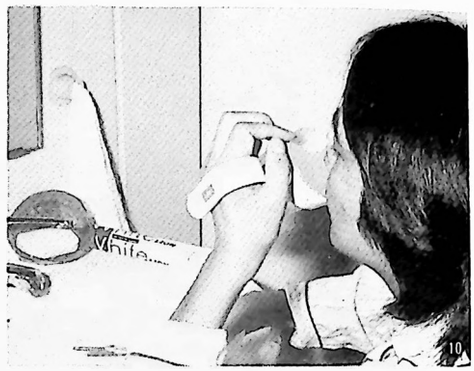




He is using a toothbrush with a holder which is fitted to the brush handle to fix the brush to his hand *(Photo 8)*. There is another type of holder with a screw with which the position of the brush adjusts according to the action required (*Photo 9*).

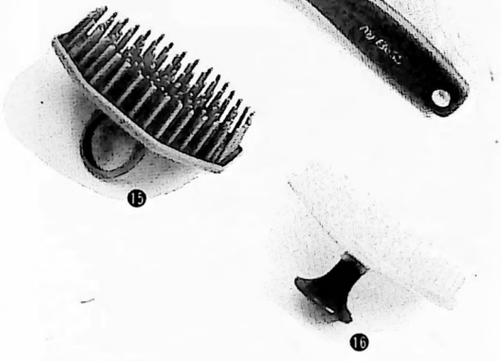


Rinsing his mouth or gargling is done by using a bowl with a holder which can be adjusted to fit the condition of his hand *(Photo 10)*.



A safety or electric razor with a holder is used for shaving *(Photo 11)*. Photo 12 shows this holder, for a safety razor which is now available on the market. Photo 13 shows a handmade holder for an electric razor.

A hairbrush with a big handle has a holder on the handle which is attached to his hand with Velcro *(Photo 14)*. Either a whole-palm type *(Photo 16)* or a ring-holding type brush (*Photo 15*) may be used for washing the hair.



A nail clipper attached to a wooden plate is used for nail clipping *(Photo 17)*. Since the clipper is firmly fixed, it can be used even by someone with weak muscles. These nail clippers can be found on the market in several sizes and strengths. The wooden bases for the clippers can be made easily.

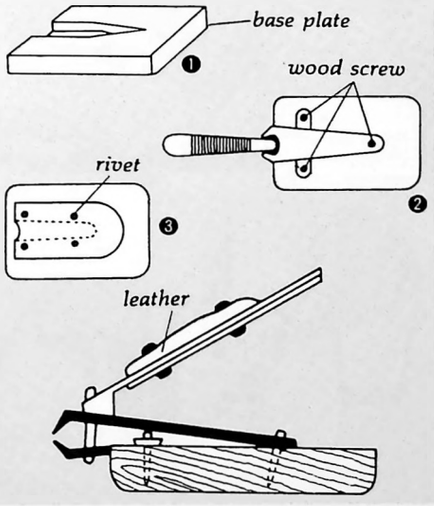
HANDMADE NAIL CLIPPER

MATERIALS

Nail clipper: *One*
Wood plates: *Two*
(Base plate of 10 × 8 × 2 cm; Upper plate of 9 × 8 × 0.5 cm)
Leather: *A small piece*
Wood screw: *Three, each 1.5 cm long*
Reinforcement metal plate: *one, 7 cm long*
Rivets: *Four*

PROCEDURE

1. *File wooden plates smooth, and chisel tightly the shape of the base plate of the nail clipper on the wooden base plate (Figure 1). The size and shape of the wooden base plate should be made so that the user may operate it easily according to his ability.*
2. *Fix the clipper to the wooden base with a wood screw through a hole at the end of the base plate of the clipper, and with a reinforcement metal plate as shown in Figure 2.*
3. *The wooden upper plate is detachable from the lever of the clipper. A piece of leather is pasted onto the wooden upper plate leaving room for the center part in which the lever of the clipper is inserted. Both sides of the leather are fixed to the board with Four rivets as shown in Figure 3, or pasted with a strong bonding agent so that the lever of the clipper will not be loose.*

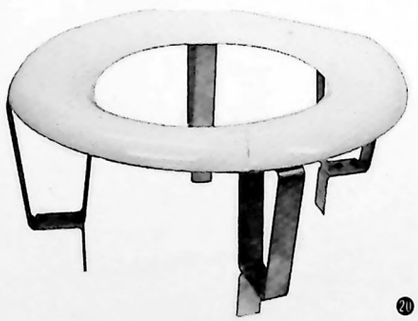


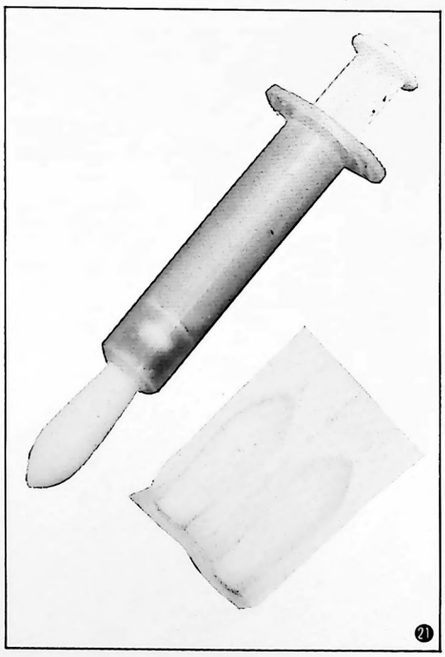
EXCRETION

Since the quadriplegic is generally thin and weak in the hip muscles, a conventional western horseshoe-shaped toilet seat is unfit for him: his hip fits too deeply into the stool, and he is unable to balance himself. An oval-shaped stool created specially for the disabled is more suitable for the quadriplegic *(Photo 18)*.

Handrails around the toilet *(Photo 19)* are helpful for shifting from wheelchair to stool. The height of the stool is also a factor. A low stool can be adjusted by putting a supplemental stool on the base stool *(Photo 20)*.

The quadriplegic who is constipated uses a suppository for loosening the bowels *(Photo 21)*. The suppository is set onto an aid made of a syringe for insertion into the anus. The suppository is inserted into the anus while on the bed, and then the person moves to the toilet.





MAKING AIDS FOR INSERTING SUPPOSITORIES BY MEANS OF A SYRINGE

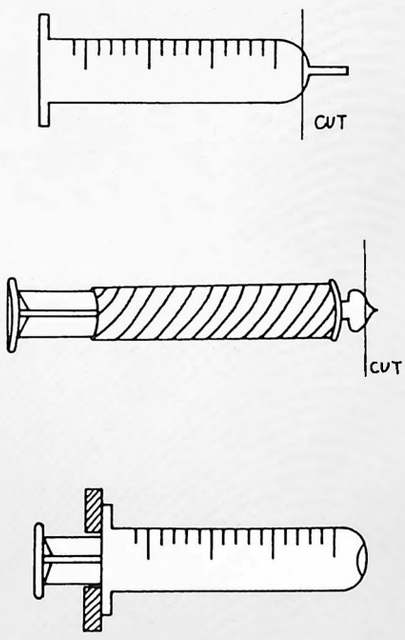
The aids for inserting suppositories are helpful to the quadriplegic who has unseparable fingers, contracted fingers, or restricted range of movement to some joints.

MATERIALS

1. *Disposable syringe 1 piece, 5 ml in capacity.*
2. *Masking tape.*

PROCEDURE

1. *Take off the rubber cap at the top of the piston cylinder (inside cylinder) of a syringe.*
2. *Cut off the top of the outside cylinder so the cut end is 0.9-1.0 cm in inside diameter, and smooth the cut end with an electric iron or a file.*
3. *Wind some masking tape around the surface of the inside cylinder to tighten it in the outside cylinder.*
4. *Smooth the end of the inside cylinder.*
5. *For easy use by persons with contracted fingers, enlarge the base of the outside cylinder of the syringe by putting something around it.*



The person using a urinal aid can discard the urine collected in the urinal bag. It is drained into a toilet bowl through a tube by turning a lever at the end of the tube (*Photo 22*). The person having no urinal aids carries a vinyl bag or a cylindrical polyethylene receptacle with him, and urinates into the bag or the receptacle while in the wheelchair. The urine collected this way can be drained into the toilet bowl. These methods are convenient since it is not necessary to always carry a urinal and the urine can be disposed of anytime at any toilet.

AIDS TO INDEPENDENT LIVING THAT I'M PROUD OF HAVING INVENTED

By Ms. Hiroko Ogura

I suffer from chronic articular rheumatism, and am unable to bend my knees or to stretch my elbows. Therefore, I was unable to put on or take off my lingerie by myself, or use toilet paper after excretion.

I have devised a solution, in the form of aids for self-help, as shown in Photos 2, 3 and 4. After a long period of trial and error, I devised special panties which I can put on or take off by myself in a standing position.

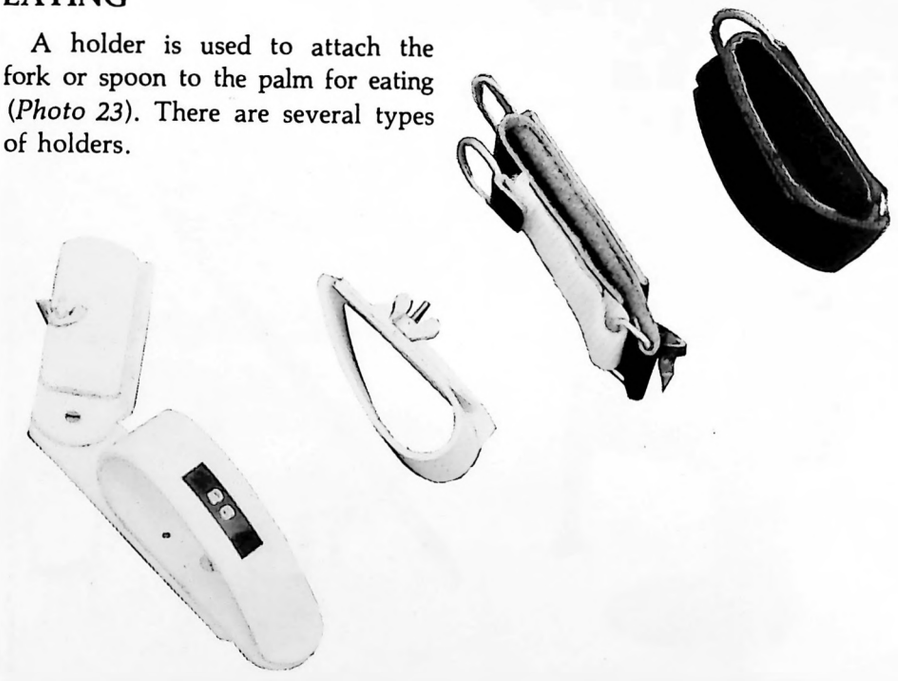
The front part of the panties is cut horizontally, and is closed by means of Velcro. When I have to use the toilet, I open the front part of the panties and tuck it up together with my skirt. Afterward, I pull the panties to the right position with a hooked stick as shown in Photo 3. Openings at both sides of the panties make it easier to put them on or take them off. A pair of snaps is sewn onto the waist so that the panties can not slip off (*Photo 2*).

I also devised an aid for wiping myself after defecating. It is a tube made of PCV, bent with heat, and fitted with a paper-holding clothespin bound firmly with tape-covered wire (*Photo 4*).

I am now free from any trouble at the toilet, and always carry with me a set of aids and toilet paper in a bag that hangs on my crutches when I go out (*Photo 1*). (Toilet paper provided near toilets is sometimes out of my reach).

EATING

A holder is used to attach the fork or spoon to the palm for eating (*Photo 23*). There are several types of holders.



HANDMADE UNIVERSAL CUFFS

These cuffs can be attached or adjusted with Velcro. They can be used for spoons, forks, pencils, and toothbrushes.

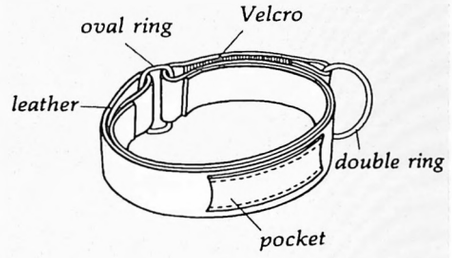
MATERIALS

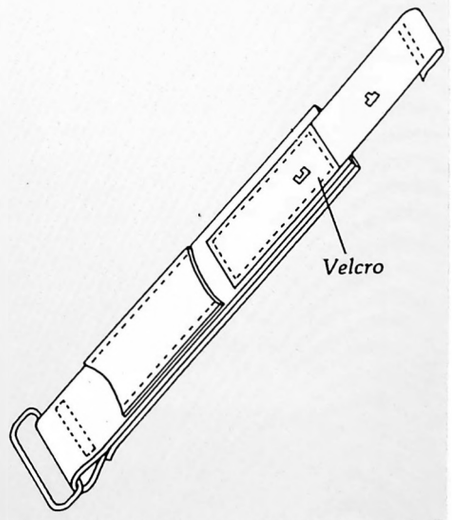
Leather as the base:	*20 × 3.5 cm*
as a pocket:	*5.5 × 3.5 cm*
Backing:	*14 × 3.5 cm*
Velcro:	*6 cm 9 cm*
Oval ring:	*One*
Double ring:	*One*

PROCEDURE

1. *An oval ring is sewn onto one end of the leather (20 cm).*
2. *Velcro is sewn onto the leather, on top of the stitching.*
3. *A pocket is sewn on the leather.*
4. *Backing is pasted on back of the leather.*
5. *Through the oval ring, the leather with Velcro is put onto the double ring.*

Because a double ring is put on the Velcro, it does not separate from the oval ring. The oval ring can be held with the fingers or the mouth.





For tea or soup, a cup with a handle for inserting the palm or the hand can be used (*Photo 24*). When holding a cup is difficult, a cup-holder with a palm-support can be used (*Photo 25*).

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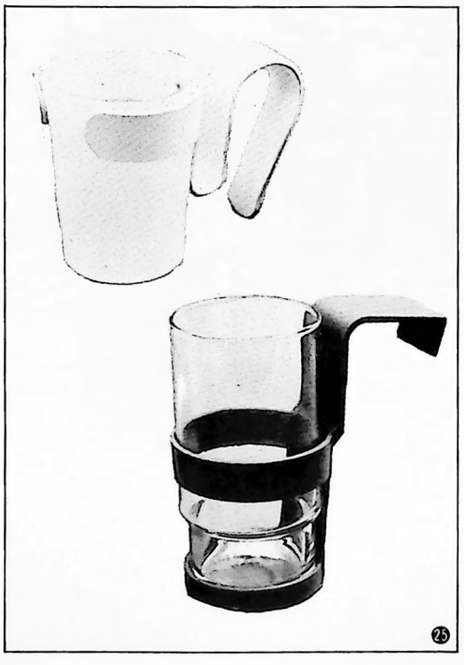
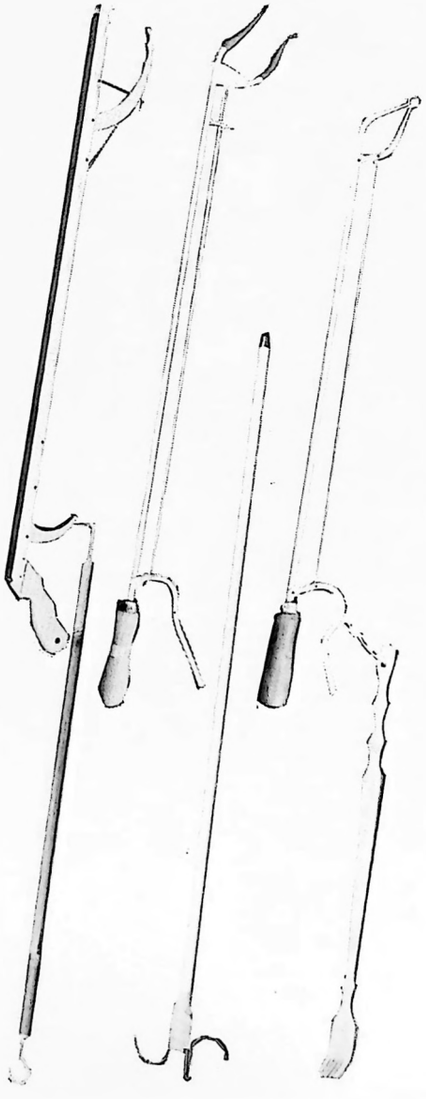


25

DOOR AND WINDOW REACHERS

Reachers are used for drawing the curtains or taking clothing out of a closet. There are two types of reachers available, hook types and grasp types. Hook types are used for getting things that the hands cannot reach. They are bamboo, plastic, or aluminum tubes with different shaped wire at the ends for various purposes. Grip type reachers are made for grasping things. There are "opening" and "closing" types of reachers, according to the shape of the tip of the device. The "opening" type is easier for the person with a weak grip. The handle of this device may be of the grip or the scissors type.



SIMPLIFIED HANDMADE STICK REACHER

This is lightweight, durable, and easy to operate. It is useful for persons with limited use of the arms, or for those in wheelchairs.

BAMBOO REACHER

MATERIALS

Thin bamboo stick with a joint 5 cm to 6 cm from the end.

Round wooden stick, 5 mm to 9 mm in diameter (to fit inside bamboo stick).

Hooks (see illustration to choose appropriate shapes for use).

Glue.

PROCEDURE

1. Place the wooden stick so that it can fit inside the bamboo stick.
2. Place glue at the opening of the bamboo stick, then insert wooden stick up to the first joint of the bamboo (to a depth of 5 to 6 cm from the end). Saw the end of the wooden stick off at the end so that it is flush with the bamboo.
3. Leave for 24 hours to allow glue to dry.
4. Drill a hole in the wooden end with a hand drill, and place glue in the hole. Insert the appropriate hook. It is ready to use after the glue dries.

NOTE

If a pegboard hook is to be attached to the end of the reacher, use a metal file to file the end of the hook so that it fits into the hole in the wooden stick. The shapes of the hooks in illustrations 4, 5, and 6 are made by bending thick wire.

ALUMINUM REACHER

MATERIALS

Aluminum tube 1.5 cm diameter.

Wire, thick, about 0.4 cm diameter, 35 cm long;
thin, about 40 cm long.

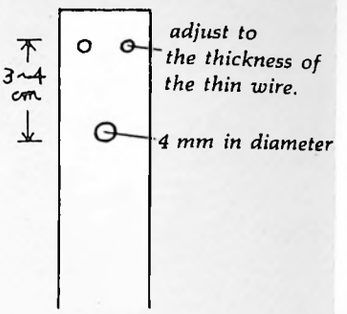
Vinyl tape.

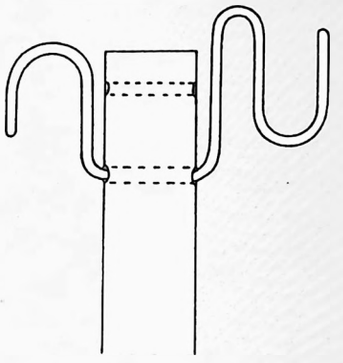
PROCEDURE

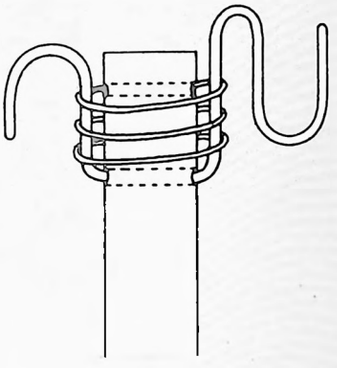
1. Cut the aluminum tube to appropriate length (according to purpose and needs of the user).
2. At one end drill two holes through the tube, as in illustration top right. Drill another hole 3 to 4 cm below these.
3. Put the thick wire through the lower set of holes, and bend into appropriate shape according to intended use.
4. Put the thin wire through the upper set of holes, then run the base of the thick wire parallel to the tube, toward the end. Attach the thick wire firmly to the tube by winding the thin wire around it.
5. Wind vinyl tape over the thin wire.

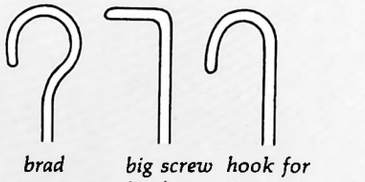
NOTE

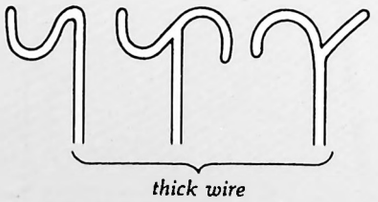
The total length of the reacher is determined by individual usage, but a length between 50 cm and 70 cm seems to be a good one.







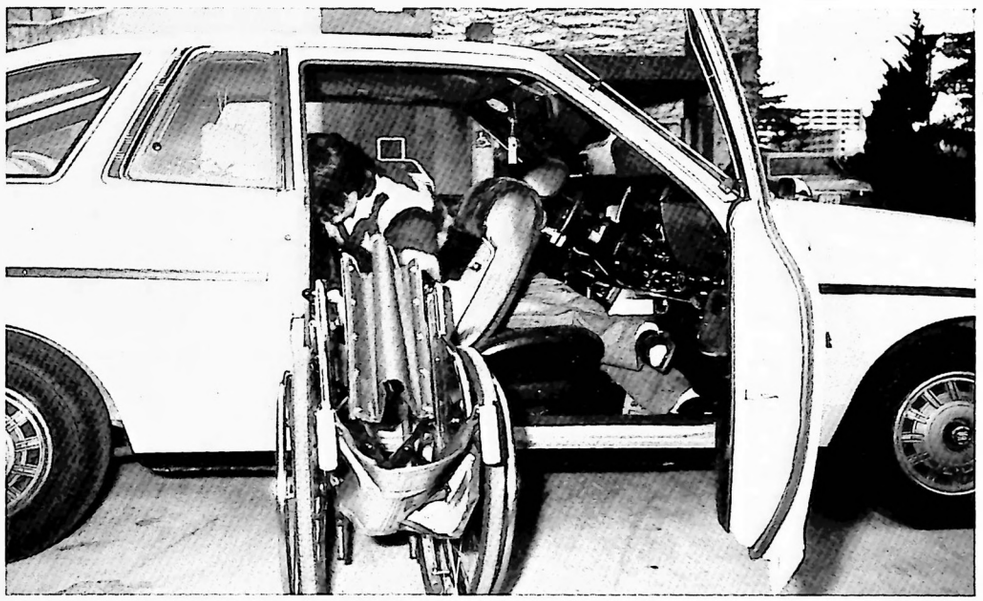




GOING TO WORK

His car has been modified with hand controls for the brakes and gas pedal. The steering wheel has a device that holds his hand in place because of his difficulty in grasping the wheel by himself.

To move from the wheelchair to the car, he places the chair next to the car at an angle, then uses his arms to pull himself to the seat of the car. From this position he folds the wheelchair, then moves to the passenger seat. He pushes the driver's seat forward, pulls the wheelchair up, and lays it on the backseat.

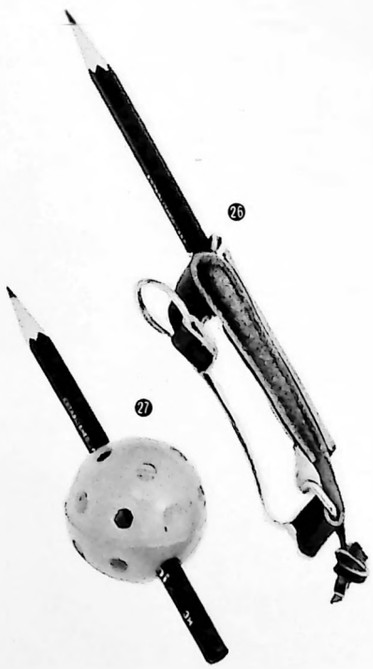


AT WORK

He uses a pencil to dial a telephone number.

WRITING IMPLEMENTS

Pencils or ballpoint pens can be used if they are fitted with thick, non-slippery holding devices. For example, they can be pushed through a golf ball or small rubber ball to make a large, rounded surface for grasping (*Photo 27*). A clip-type clothespin can also be used for a holding part. If the person cannot grasp the device, it can be attached to the palm of the hand (*Photo 26*).



HANDMADE GRIPPING AID FOR WRITING IMPLEMENTS

This device can be quite stable, is adaptable to most writing implements, and can be changed easily. It is intended for the person with weak grip power, or who cannot grasp a thin implement.

MATERIALS

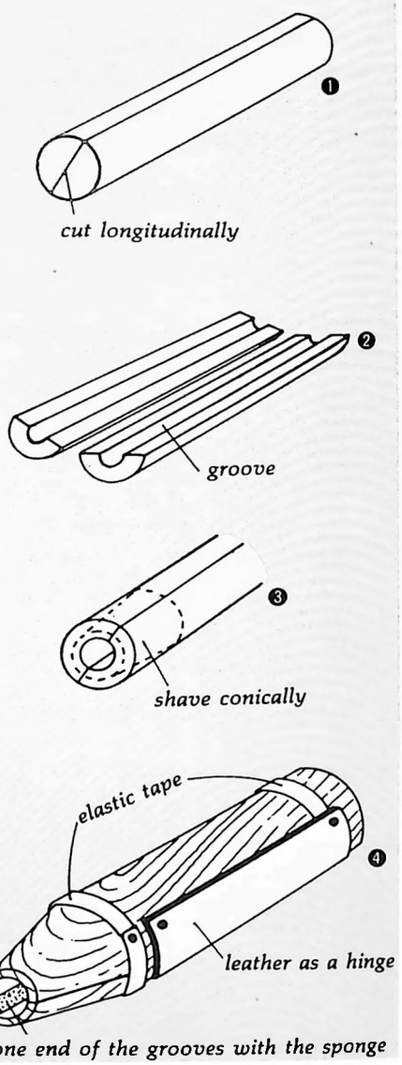
A round wooden stick, 3 cm in diameter, 11 cm in length.
A sponge, 11 cm × 0.5 cm × 0.5 cm.
Leather, 7 cm × 3 cm.
Elastic, 0.7 cm wide × 20 cm long.

PROCEDURE

1. Cut the round wooden sticks longitudinally and groove, as in Figure 2.
2. Shave one end of the wooden stick conically, as in Figure 3.
3. Connect the separated wooden sticks together by using the leather as a hinge.
4. Line one of the grooves with the sponge.
5. Wind the elastic tape on the upper and lower parts of the stick to fix firmly.

NOTE

By changing the size of the groove, this can be used not only for writing implements, but for other purposes as well. Just make sure that the things placed inside are consistent in diameter.



TAKING A BATH

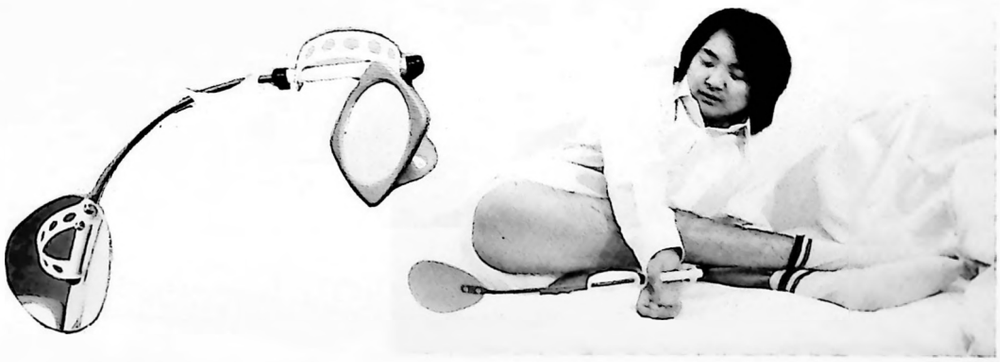
Quadriplegics have to use extra caution in the bath area. Because they don't usually have their moving devices with them, they have to be especially careful not to injure themselves or incur abrasions while dragging themselves from one place or position to another. These wounds and abrasions can cause bedsores and other problems. People with cervical cord injuries have sensory loss below the breast, and need to be even more cautious than others.

A rubberized suction bath mat helps to prevent slipping. When reaching the back is difficult, toweling can be cut to the desired length and fitted with loops on each end. There are also rubber sponges with long handles for washing the back. When washing the hair cannot be done easily with the hands or fingers, a hairbrush that can be attached to the finger or the wrist can be used.

For convenience in getting in and out of the tub, there should be handrails at appropriate locations. In cases of a big gap in height between the bathing area and the tub, a bathing chair of a non-slippery material can make the process easier. To prevent the bottom of the tub from being slippery, a non-stick rubber suction mat or appliqués should be used.

Suction-type rubber mats with non-stick surfaces are available for the bottom of the tub. Because the paralysis involves sensory loss of the skin, the quadriplegic must be very careful not to let the water temperature get too high. A thermometer should be available in the bathroom at all times.

The skin should be checked every day for rashes or abrasions. This can be done either in bed or in the bathroom, with the use of a mirror with a flexible handle, or with two mirrors. This daily check of the condition of the skin is of the greatest importance for quadriplegics.



RECREATION

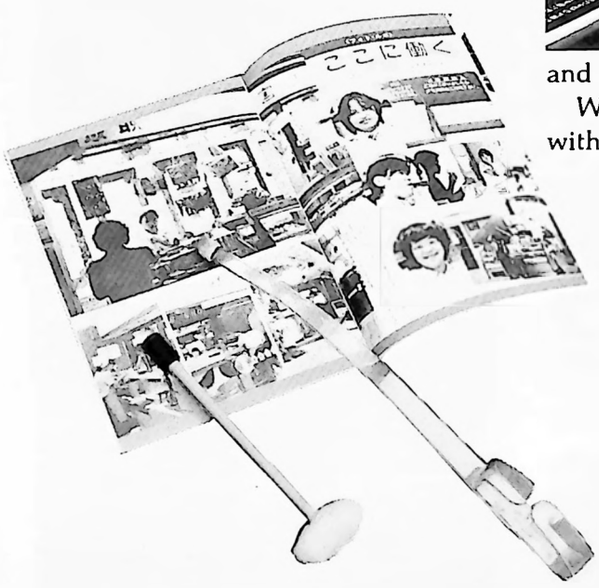
There are various devices for use in reading, sports, entertainment, or hobbies. If turning the pages of a book is a problem, a rubber or leather-tipped page turner can be used. The handle is big for easy gripping. When watching television, turning switches and dials on and off and changing channels may be difficult. If cloth is wound around the knobs or switches, with loops left hanging from them, a reacher can be hooked through the loops to perform the desired maneuvers. Rubber or tape can also be wrapped around the switches or knobs to make them thicker for easier grasping and to provide friction for easier rotation. A wooden lever can also be attached. Remote control switches

are helpful too.

Special ashtrays are convenient. After a cigarette butt is placed on the top of the ashtray, the knob is pushed down, the butt falls through the opening, the knob is released,

and the lid closes automatically.

With a paddle attached to his palm with Velcro, he can play ping-pong.



He does his laundry by himself. After the clothes are washed he uses a reacher to remove them from the washing machine. The height of the clothesline should be lower for people in wheelchairs.

URINARY INCONTINENCE

Urinary incontinence can be defined as uncontrollable or involuntary urination. There are four main types:

A. Complete incontinence

Not being able to hold urine in the bladder.

B. Overflow incontinence

To have a large amount of residual urine as well as urinary incontinence.

C. Reflex incontinence

To be able to hold urine in the bladder for a few seconds, but then to urinate involuntarily.

D. Abdominal muscle contraction incontinence

To have almost normal function of the urinary bladder, but to urinate involuntarily when coughing, laughing, or lifting heavy objects.

In the event of urinary incontinence, a urologist should be consulted. With proper treatment and training, many cases of urinary incontinence can be brought under control without the use of urinals. This is especially important for those women with urinary incontinence who do not have suitable urinals.

In general, urinal devices are not suitable for people with overflow incontinence. Instead, appropriate measures should be taken to dispose of the residual urine. Some mild cases of abdominal muscle contraction incontinence can be considerably improved or even cured through medical treatment and therapy. Many people with complete incontinence or reflex incontinence need some kind of urinal aid or device.

URINALS

There are many types of urinals or other devices available for urinary incontinence. They are divided into three main types:

Type A:

For the male, a device that fits on the penis, and for the female, attaches to the vulva, for the purpose of managing the excreted urine.

Type B:

Prevents incontinence through pressure from outside the urethra.

Type C:

An instrument that transmits an electric stimulus to the nerve system concerned with storing urine, in order to prevent urinary incontinence.

A description of each type follows:

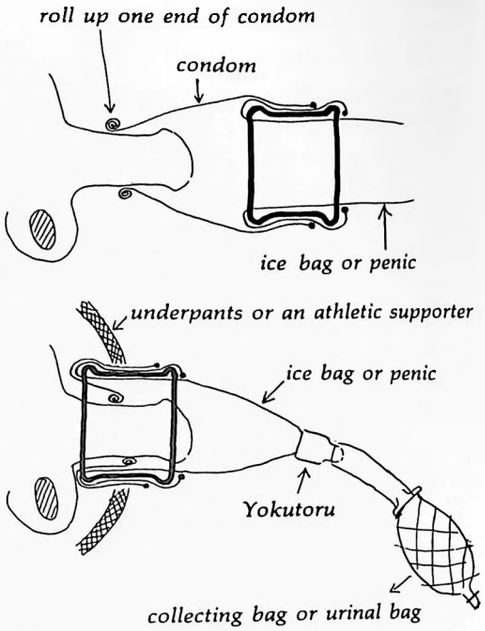
Type A. Male

Because it is easily made and can be adjusted to individual shape and size, this type is widely used. It has a plastic ring (*Photo 28*) and a

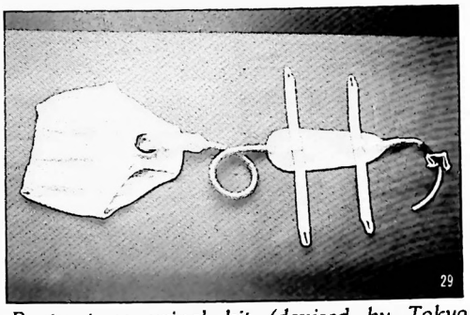
condom to prevent backflow. Because it can be divided into parts, it is easy to change the components, which facilitates cleaning.

This device can be made inexpensively by improvising the components. Attach an ice bag or a penic (*a type of urine-collecting bag*) and in figure above. Attach this to a pair of underpants *(Photo 29)* or the athletic supporter (Fukumi Co.) in Figure 8. suporter (*Figure 8, Fukumi Co.*).

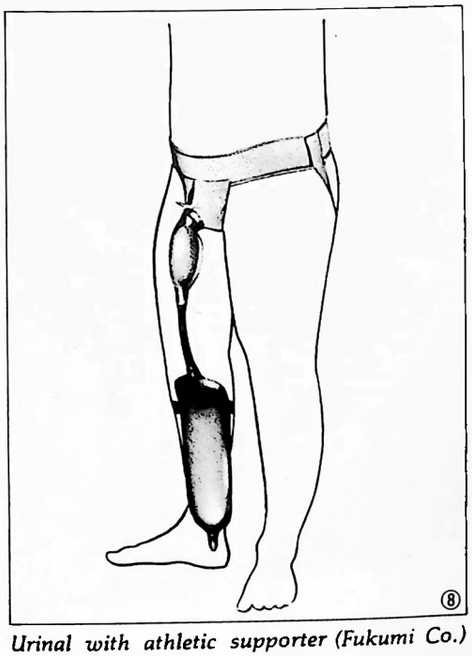
To augment the holding capacity of the ice bag or penic, attach a urine-collecting bag (*Tokyo Eizai Co.*) or urinal bag (*Takei Ika*) to one side of the ice bag, using a rubber tube and a plastic clamp (*Takei Ika*).



Urinal kit using hard plastic ring.



Panty type urinal kit (devised by Tokyo Metropolitan Rehabilitation Center).

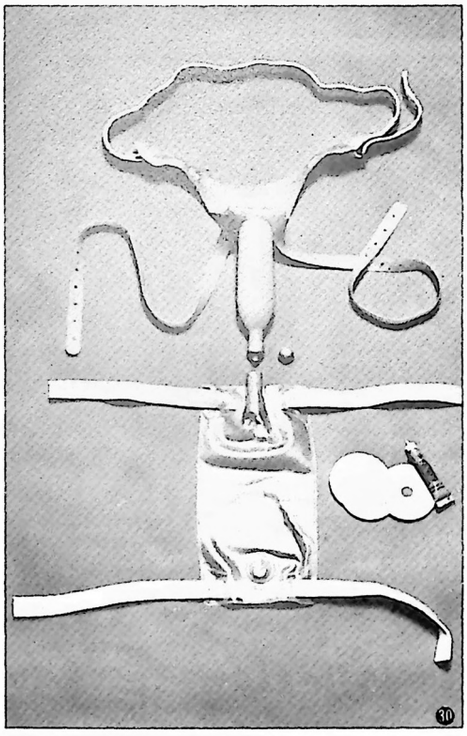


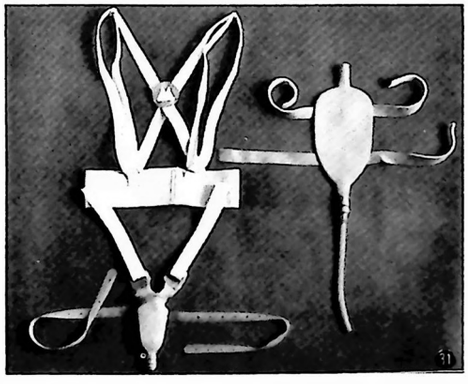
Urinal with athletic supporter (Fukumi Co.)

There are other types that use a very thin rubber membrane instead of a condom. They are: Davol (*made in U.S.A.*), Unibon (*Photo 30, Tokyo Eizai*), and Unibon for children (*Photo 31*).

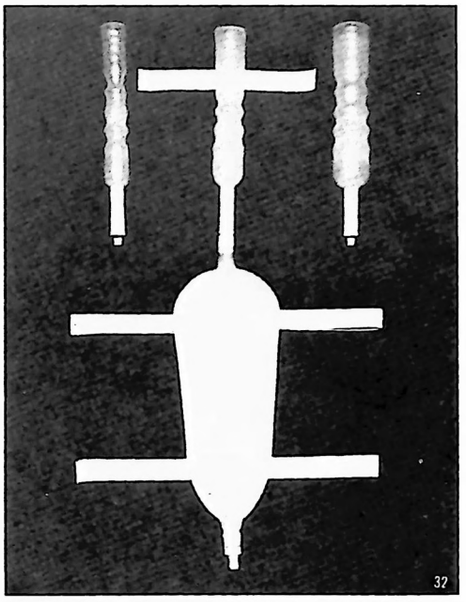
In using these urinal kits, the following are important factors:

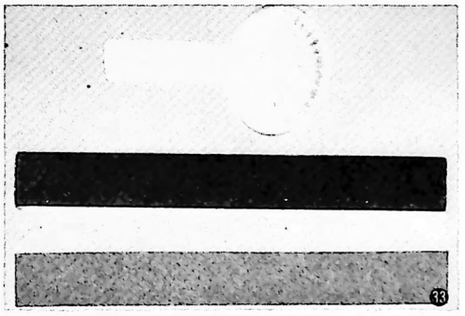
1. Because the condom could easily injure the penis, it should be cut to fit well, and the cut edge should be rolled several times to prevent abrasion.
2. Rubber touching the skin directly can cause irritation.
3. To keep the penis clean, the urinal should be removed and cleaned once daily.
4. Extra urinals should be available for alternate use while the original one is being cleaned.





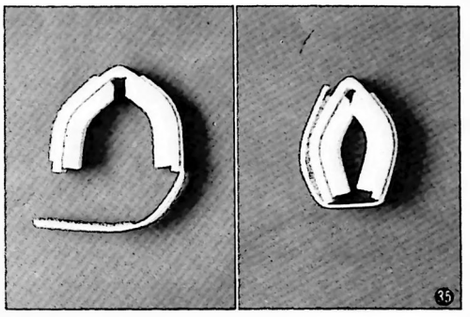
If the amount of urine is small, a penic (*Photo 32, Tokyo Eizai Co.*), an external catheter (*Photo 33, Rusch Co., Sagami Rubber Co.*) or a vinyl bag (*Photo 34*) can be attached directly to the penis with Velcro. When using these kits, care must be taken not to make the tape too tight, and also to keep the penis clean.





THE PENI-CLAMP

The Peni-clamp (*Photo 35, Fuji System Co.*) is useful while dressing, bathing, and so forth. But care must be taken that the curve fits the size of the penis exactly in order to adjust the pressure on the penis. It should not be used for more than two hours.

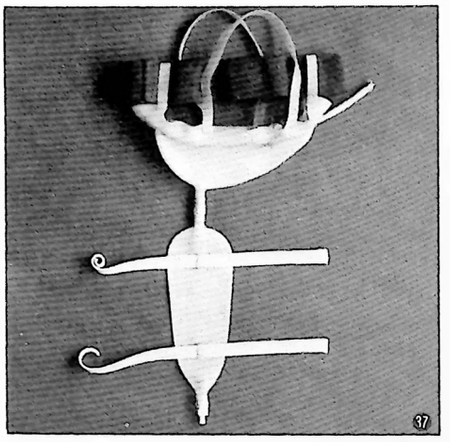


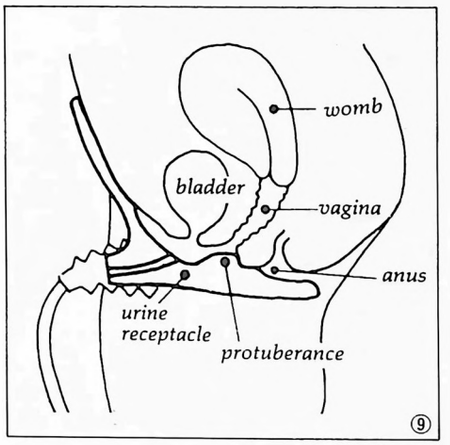
TYPE A. Female

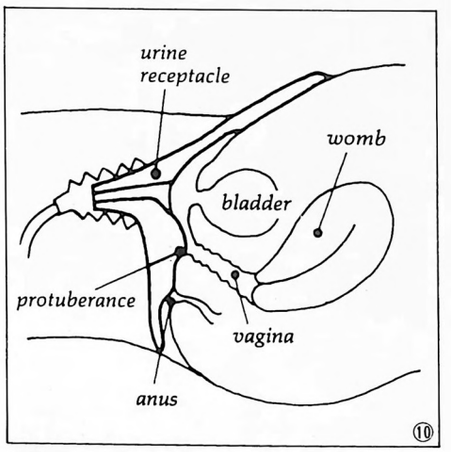
The urinal kit is closely attached to the vulva. This can be done with paste (*Photo 36, F-Pack*) or with belts (*Davol, made in U.S.A.*), (*Photo 37, Minibon, Tokyo Eizai Co.*), (*Figures 9, 10, Ladynal, Tokyo Eizai Co.*). In general there are good devices available for bedridden females, but for those who are more active, either in wheelchairs or otherwise, the devices are not entirely satisfactory. At present, for those women, because of pubic hair and individual anatomical differences, the fit is not precise enough.

TYPE B. Female

The purpose is to prevent urinary incontinence by exerting pressure on the urethra through the vagina. There are many kinds of kits available, but because some degree of knowledge of anatomy is required for use, they have not been widely popular.

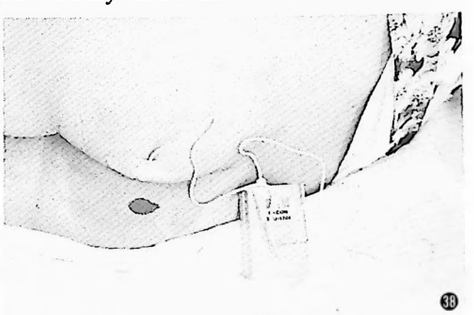


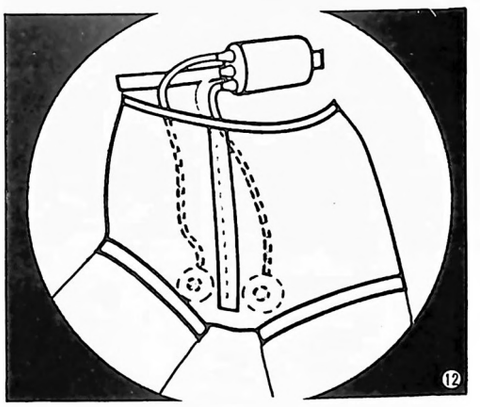




TYPE C. Male and Female

This type electrically stimulates the pudendal nerve controlling the sphincter urethra muscle. One type of such kit is the Ucon (*Photo 38, Nippon Koden Co.*). There is also the Anal Plag (*Continence aid, made in Britain*), which prevents urinary incontinence by giving an electrical stimulus to the anal muscle to contract the urethral muscle. Another kind is the urinary incontinence preventive apparatus (*Figure 12, Uristop*) with a built-in minicomputer, which was developed recently in Denmark. This is actually a thermo-sensor which detects small amounts of urine, and its minicomputer sends electric stimuli to the sphincter urethra muscle to prevent urinary incontinence. But the last two kinds require considerable medical knowledge, such as the exact locations for placement of electrodes. Therefore, they are not as widely used as the Ucon.





TRANSPORTATION

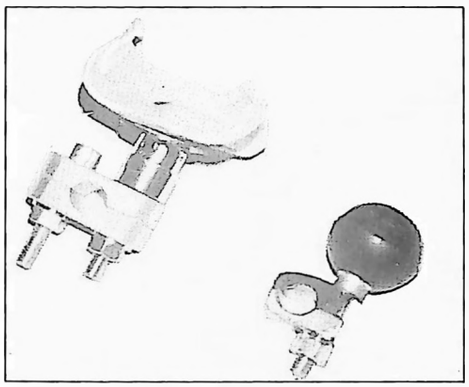
Automobiles are convenient for the handicapped, both for work and to extend the range of activities.

Recommended equipment for handicapped drivers:

1. A partially modified car, or a car fitted with special mechanisms.
2. Special devices for the individual driver.

STEERING WHEEL RIM

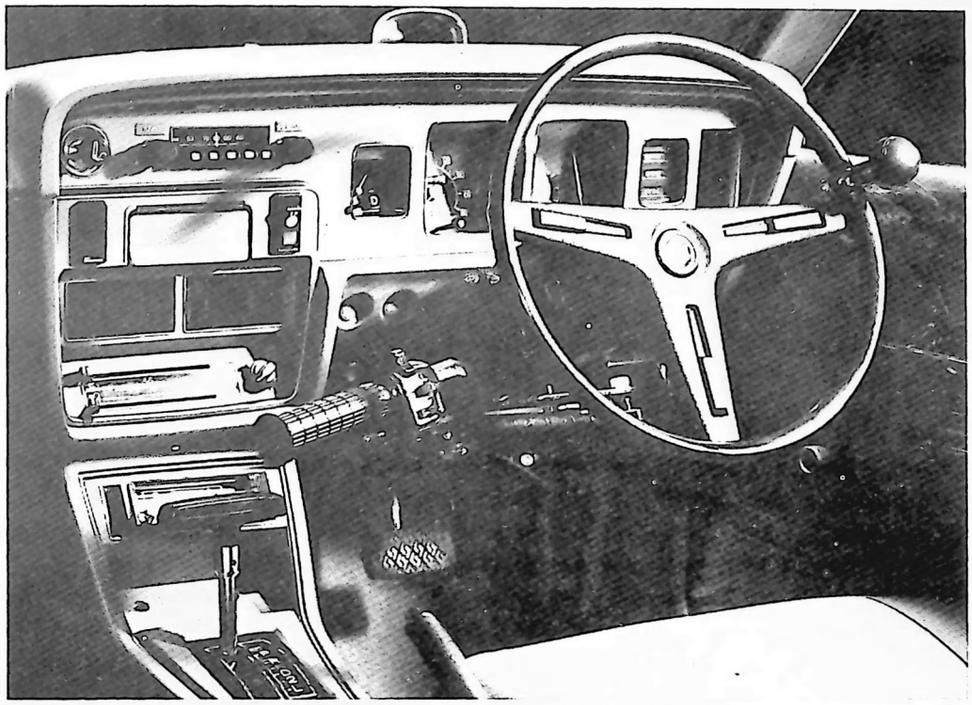
If the steering wheel has to be controlled with one hand, there should be a spinner knob on the rim. If a knob cannot be grasped, U-shaped equipment can be used instead to secure the hand to the wheel.

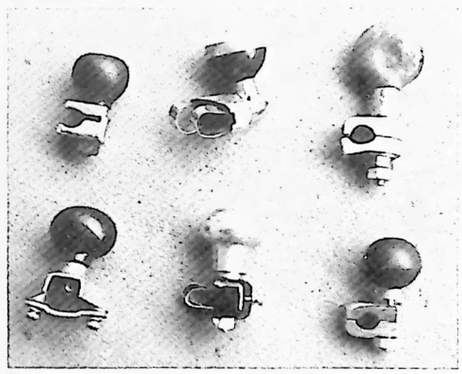


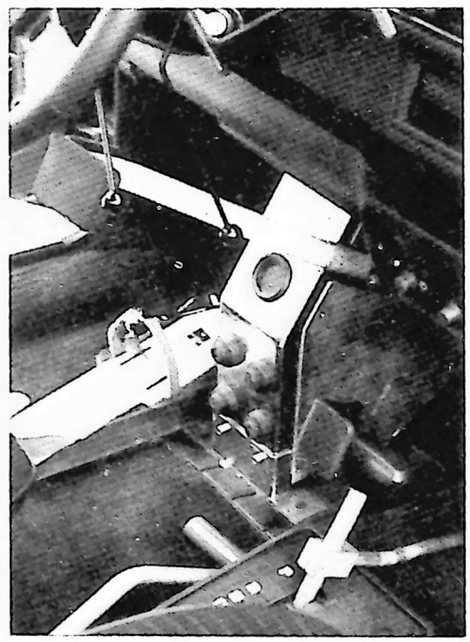
CONTROL SYSTEM

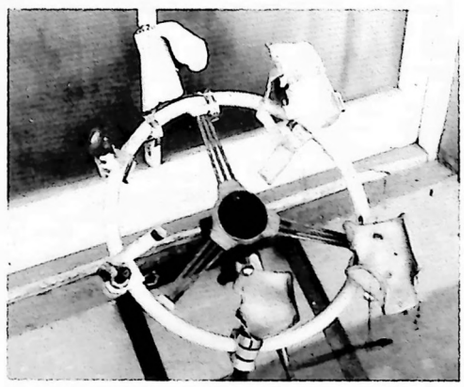
For a person whose treading capacity in one leg is less than 10 kg, and for 20 seconds or less, an automatic gearshift should be used. The gas pedals and brake have to be operated by the non-disabled leg. If the person does not have the abovementioned tread capacity, or cannot switch from the gas pedal to the brake within 0.85 seconds, or if he is paraplegic, then a car with a hand control system should be used.

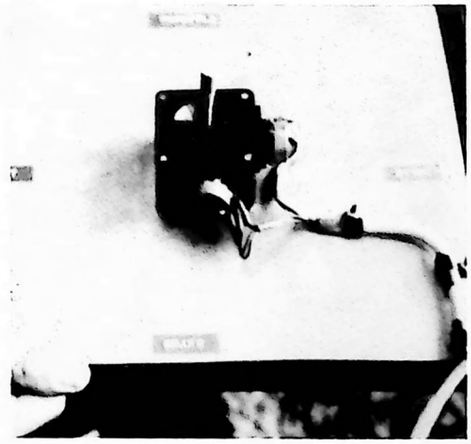
The quadriplegic needs devices to facilitate locking doors, and using the directional signal, horn, windshield wipers, and dimmer switch. These devices should be adapted to individual needs. Real driving capability however, involves judgment and perception as well as physical skill. Therefore, driver training should be thorough, comprehensive, and provided by a specialist in the field.











TELEPHONING

Use of the telephone is a must in today's society. This is especially so for the disabled, who cannot get out easily. For them, the telephone can facilitate simple everyday communication, business, or dealing with emergencies.

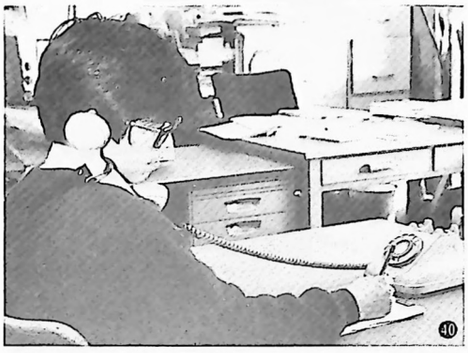
FOR THOSE WITH DISFUNCTIONS OF THE UPPER EXTREMITIES

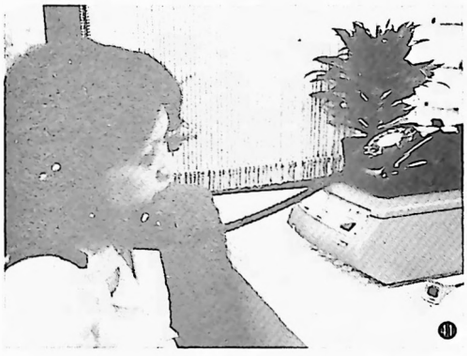
For someone who cannot hold the receiver there are various devices to stabilize it on the shoulder, such as the Telekaru (*Photos 39, 40*) or shoulder device (*Photos 41, 42*). For those with poor balance, the types in Photos 44 and 45 are more suitable than those of the shoulder-mounted variety.

Photos 44, 45, 46 and 47 show telephone devices for the severely phosically disabled. The Telephone Mate (*Photo 43*) can be operated with very slight pressure on the buttons. It can also be adjusted so that it can be used with the foot or other part of the body.

The person who cannot maintain a suitable position for a receiver type telephone, or who is bedridden, can use a "speaker-phone" (*Photos 46, 47*). This has a built-in speaker and micro-phone, and can be operated simply by pushing a button. As the volume is easily controlled, it is convenient for those with hearing disorders. The speaker-phone can be used for conference calls as well.

The entire wall-mounted telephone unit can be lowered to a convenient height by pushing a button. Instead of a regular receiver, a headphone is available. The lowered height of the unit makes it easy to get change from the coin return slot.





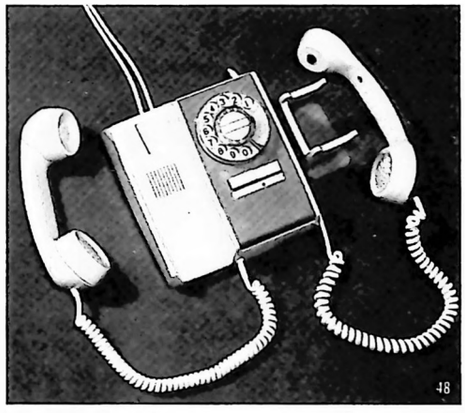
PHONES FOR THE HEARING-DISORDERED

For those who have difficulty in hearing the telephone ring, there is an apparatus which signals an incoming call with a flashing light (flash bell). Connected to the telephone, it flashes every 3 seconds. There is also an apparatus which uses a low frequency sound for the bell, and can be used by those who can pick up these kinds of sounds. It is called the "silverbell."

If the person has difficulty in listening, a volume dial "Silverphone-Meiryo" can be attached to the receiver. The volume can thus be amplified up to 25 decibels.

For people who have trouble in speaking, there is a telephone machine which transmits sounds through the vibrations of bones in the head. (*Photo 48*).

The MCM telephone for the deaf (*Photo 49*) employs a kind of key-punch system. The caller places the receiver on the keyboard, punches the keys, as in a typewriter, and the written message appears as print on a board at the receiving end of the call.



OTHER PHONES

The silverphone "Anshin" (*Photo 50*) is the most reliable for emergencies. By setting a regular telephone on this apparatus, the other end can be called automatically by just pushing a button. The caller does not even have to pick up the receiver. There are two buttons, a red one for emergencies, and a green one for friends or family. When the red

button is pushed, the phone calls a pre-set number (doctors or relatives, for example) automatically, and sends a pre-recorded message. If the red button receiver is busy or there is no answer, the call is turned over to the green button. If a remote control switch is used, the buttons can be pushed from one's bed. The receiving person's voice is amplified to 3 times normal sound, which makes it convenient for those with hearing difficulty.

The portable phonic loudspeaker "Hi-Fi Phone" (*Photo 51*) is available for the person who prefers not to put any equipment on his telephone, or those who want to be able to use other, outside telephones as well. When the bell rings, the receiver is picked up and placed at an appropriate location. The voice at the other end is amplified through the speaker of this voice-amplifying device, which is placed near the telephone. It is convenient to carry, and can be used easily with any telephone. It is also useful for those who have difficulty in holding a receiver for a long time, or those who have difficulty in hearing. With this device, several people can speak on one end, making it convenient for conference calls.

For those who have very poor eyesight or are blind, a round dial board is recommended (*Photo 52*). This provides projections on the dials (*3, 6, 9*) which allow for easy discrimination by touch.

DIAL TURNER

Weakness or loss of finger movements may make dialing very difficult. In such cases, attaching a stick to a cuff makes it easier. A push-button phone is also helpful.

Severe Cerebral Palsy

Next we introduce a man and a woman, both of whom have severe cases of cerebral palsy. After finishing a special high school for handicapped students, they received some practical training for daily living at the Tokyo Metropolitan Rehabilitation Center for the physically and mentally handicapped. They now lead active lives, living in their own homes.

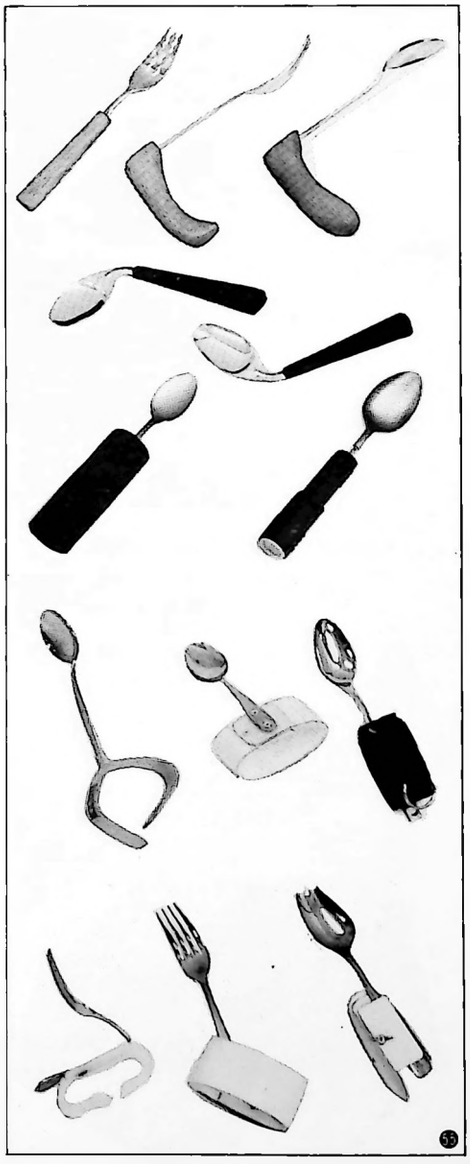
Ms. Hanayo Morikawa, 18, can perform almost any essential routine daily activity with just her left hand. Because her involuntary movements were so severe, it took a long time to bring them under control. Through training, hard work, and continued motivation she was able to achieve the independence necessary for daily living. She moves her wheelchair with her left hand and left foot. She can stand if she holds on to something. On the floor she moves by crawling on her knees.

Mr. Yoshiaki Muramatsu, 19, can do most routine daily activities by himself, with some help from others at times. He can walk by himself.

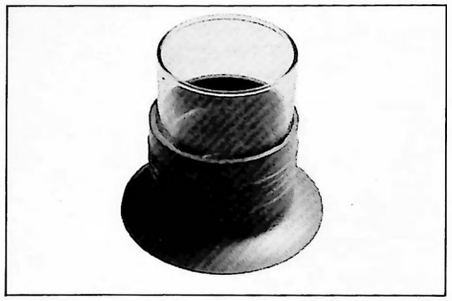
EATING

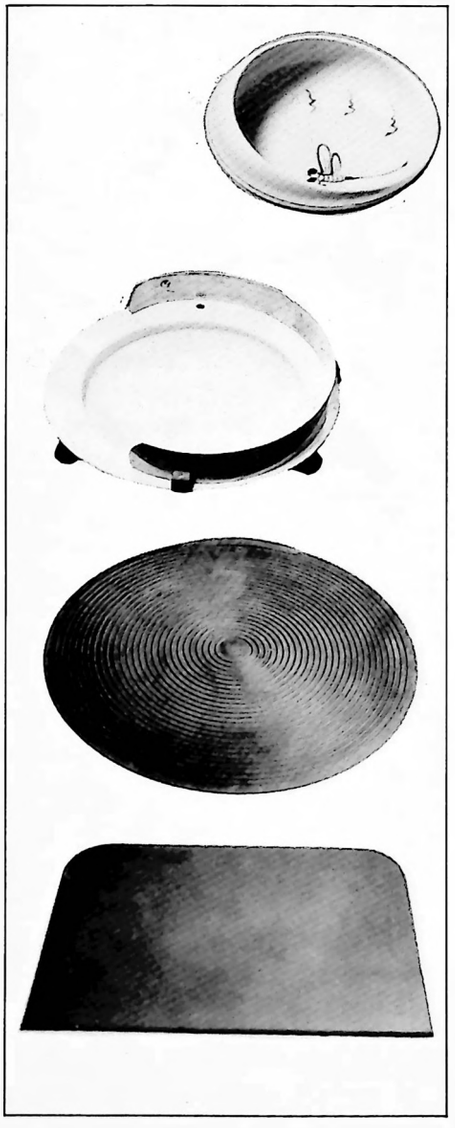
When eating, Hanayo uses a non-skid placemat and a specially-shaped dish which makes it easier to lift out the food. She uses regular spoons and forks by wrapping her fingers around the ends (*Photo 53*). Because she cannot hold a cup, she drinks through a straw attached to a cup made stable with a wide base (*Photo 54*). Since the involuntary movements make spills inevitable, she needs an apron, a tablecloth, and a floormat.

Special spoons and forks are shown in Photo 55. The thick handles and angles make for easy use by almost anyone, even by those who cannot move their wrists or elbows voluntarily. Some types can be gripped with the foot instead of the hand, and there is one, the "spork," that has the function of both spoon and fork. In cases where gripping is impossible, spoons or forks with holders can be used.



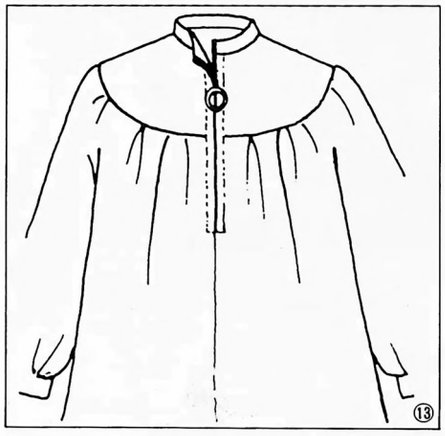
For persons likely to upset a cup, there is a glass stabilizer made of rubber, and a non-spill cup with a weighted bottom.

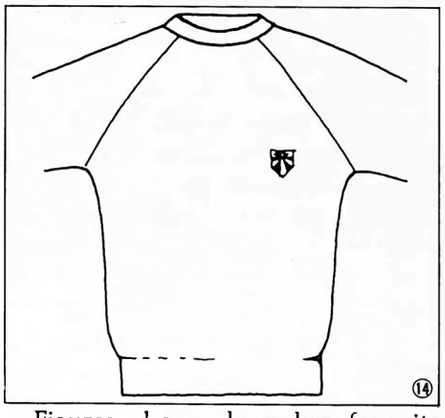




CLOTHING

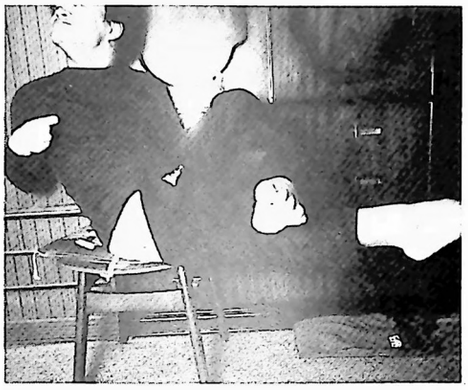
Dresses with raglan sleeves and no zippers, hooks, or buttons are especially easy to put on and take off. And clothing made of durable knitwear can take the pulling and tugging that occurs in dressing and undressing. Slightly larger sizes and loose styles are good, as are skirts and slacks with elastic waistbands or drawstrings.





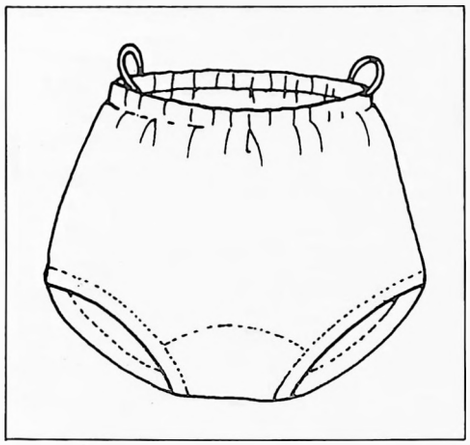
Figures above show her favorite clothes. In Figure 13 one can see a zipper on the front, with a strap attached to the tab. She pulls up the strap with her finger or her mouth *(Photo 56)*. She wears sneakers which are fastened with Velcro instead of a button or hook.

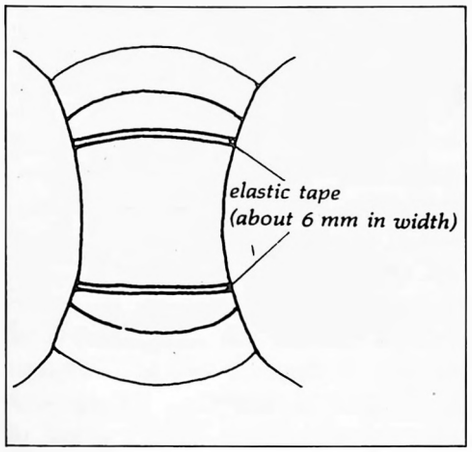
Yoshiaki can put his trousers on with his feet. The front has a rubber loop attached to the zipper, and Velcro instead of buttons or hooks. He sits on a chair and pulls his trousers up to his knees with his feet. Then, in a standing position, he hooks his fingers through the rubber loop and pulls them up the rest of the way, zipping the trousers and fastening the Velcro.



PERSONAL HYGIENE

Routine menstruation procedures can be difficult for severely disabled women like Hanayo. She uses tampons and sanitary napkins with adhesive tape, as well as a special panty with elastic tapes to hold the napkin securely in place. The tapes are attached to loops at the waistline. Since it is hard for her to change the napkin on the toilet seat, she does it on her bed, stretched out with her knees flexed.

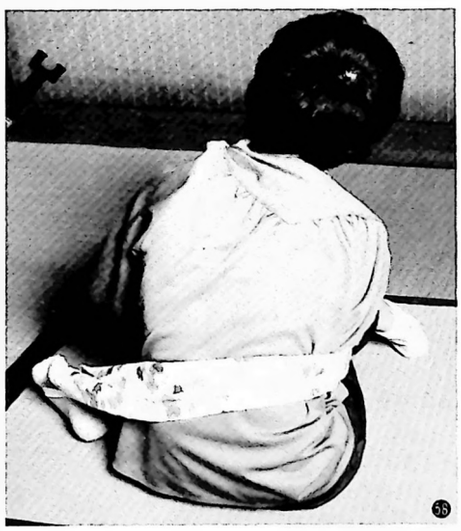




After a bowel movement, Yoshiaki wipes himself by using a paper-holder. First he wraps paper around the holder with his feet, then he moves his buttocks on the paper. The end of the paper-holder stays hooked to the wall, at the proper height for his needs. This is the most convenient way for him to accomplish this basic activity without using his hands.

BATHING

Hanayo washes herself with her feet, using a towel with loops on each side (*Photos 57, 58*). She shampoos her hair with the use of a brush mounted on a roller, which compensates for her limited arm movements. Her shampoo and rinse bottles have levers on the caps for easy pouring (*Photo 59*).



COMMUNICATING

Hanayo has difficulty in speaking and writing. Therefore, an electric typewriter is her means of communicating. It has a special lever with which she can type by using only her index finger.

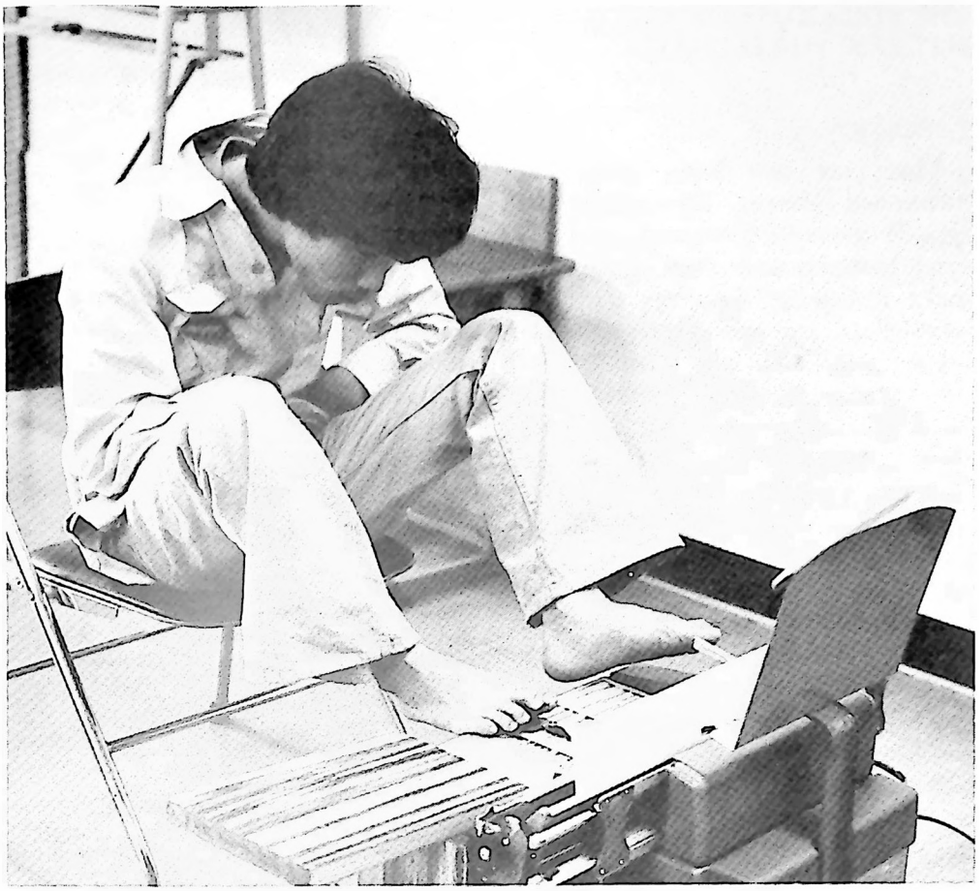
ELECTRIC TYPEWRITERS

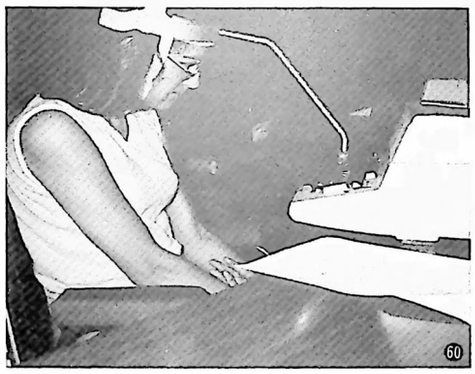
Electric typewriters are convenient because they can be used by just touching the keys lightly. Some have remote control systems. One kind is controlled by three pedals. The basic letters of Japanese are shown on a board. The pedals cause the individual letters to light up. When the correct letter is lighted, the printing pedal is pushed. The printed letter is shown on a TV monitor.

The second type is controlled by only one button. This is operated by voice, by the tongue, by blinking, or by eye movements through a lens. By setting up a special circuit, tongue movements instead of finger movements can operate the typewriter.

When typing, the person should use the best possible posture in order to use his energy efficiently. The individual has to find a way to control the body and fingers according to his own condition. The height of the typing table is also an important factor. In some cases the typewriter should be placed on the floor.

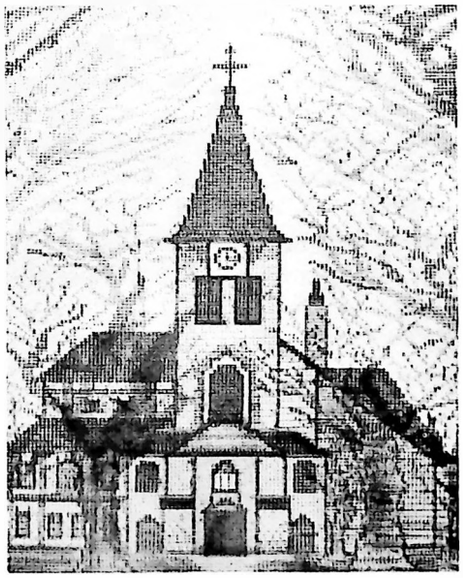
Some people can learn to type in a day. Others need up to three months. It depends on the individual condition and disability. Typing with the toes or with a stick instead of the fingers may be involved. In Photo 60, a woman is typing by means of neck movements.





"TYPE ART"

This picture was made by typing letters. With practice, even severely handicapped children show unexpected ability in this kind of activity. It does not take much skill, and most people can learn it easily. Group work has proved to be an effective way to teach "type art," and is probably better than private lessons.



HANDMADE CHAIRS FOR CHILDREN

This chair was made by Mr. Yuichi Iokura as his university graduation project. He had become aware that most chairs for children were too hard to be comfortable for those with cerebral palsy, and wanted to develop one that would be suitable.
Characteristics:

1. The backrest and seat are covered with thick hemp cloth, which is porous, holds its shape, and is soft to the touch.
2. The adjustable backrest has two positions. It can also be changed to a rocking chair, and a ready-made table can be attached.
3. The height of the seat is adjusted in order to enable the child and the mother to make eye contact when both are in a sitting position.

ELECTRIC WHEELCHAIRS

TYPES OF ELECTRIC WHEELCHAIRS

1. SIMPLIFIED ELECTRIC WHEELCHAIR

This type consists of batteries and control systems attached to standard hand-propelled, collapsible wheelchairs.

2. ELECTRIC WHEELCHAIRS

This type was developed for the severely disabled. There are two kinds: the standard, non-reclining, and the multi-function. The latter has a reclinable backrest, adjustable seat height, and various types of remote control systems.

THE STRUCTURE OF ELECTRIC WHEELCHAIRS

1. BODY

There are two body types, as mentioned above. The collapsible type is convenient to store, but the extra batteries and other equipment make it heavier than the standard wheelchair, and the severely handicapped must have help when attaching batteries or setting up the chair. Two of the four wheels of a wheelchair are used as drive wheels. Depending on the location of this set of wheels, the chair can be categorized as front-wheel drive or rear-wheel drive. A front-wheel drive chair is better for uneven surfaces or terrain, but inferior for holding to a straight course. The larger the drive wheels, the better on uneven surfaces or those with gaps in height, but this does not hold true for maneuverability in sharp turns.

2. CONTROL SYSTEMS

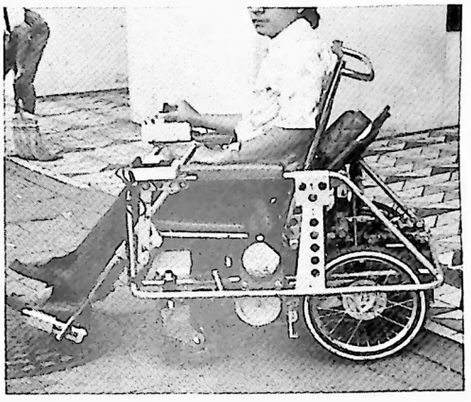
Direction and speed control systems are usually built into a control box. The box contains a power switch, a light, an ammeter or voltmeter, and a control lever. The most frequent sources of trouble for the electric wheelchair are control box and electric circuit-related. Therefore it is important to keep from jarring or hitting the control box, and also to keep it from getting wet.

3. BRAKES

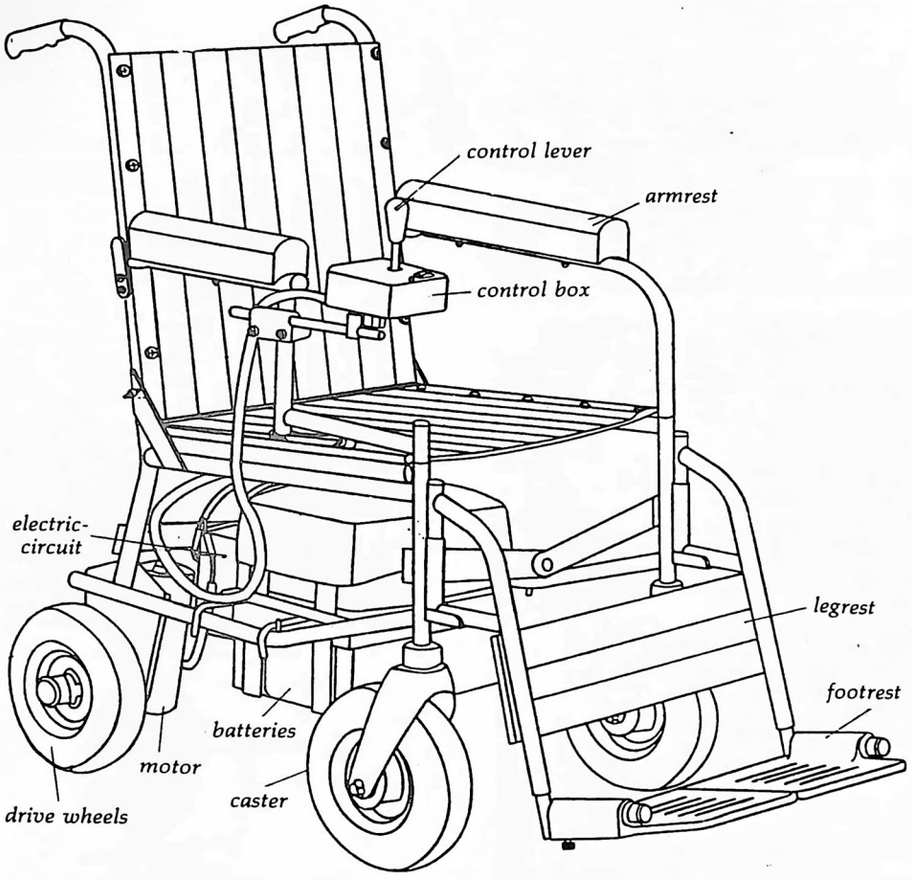
Brakes are a critical part of the wheelchair, and should be kept in good working order. This is especially important when the chair is used outdoors. A reverse-motor braking system is generally used. Also available as options are electromagnetic brakes or power brakes to be used with the reverse-motor braking system.

4. BATTERIES

Almost all electric wheelchairs use car batteries (lead batteries). The weight of the battery is 25 to 50 percent of the total weight of the wheelchair. Because the wheelchair moves at a slow speed, the battery cannot be recharged while running, as can that of a car. Batteries need constant care, such as recharging after adding battery fluid (*dilute sulphuric acid*). The life of a lead battery is 2 to 3 years for a car, 1 to 1.5 years for a well-maintained wheelchair, and only 2 to 3 months for a poorly-maintained one.



THE STRUCTURE OF ELECTRIC WHEELCHAIRS



WHO CAN USE ELECTRIC WHEELCHAIRS

An electric wheelchair is indicated for the person who cannot control a hand-operated wheelchair, or who finds it difficult. For those who cannot keep a sitting position for long, the multi-function chair with reclining mechanism is recommended. Learning to control an electric wheelchair can be a lengthy process, especially for people with severe cases of cerebral palsy or with cervical cord injuries. If weakened muscles preclude the use of standard control levers, chin or breath-operated controls are available. The severely disabled may need assistance with such necessities as transferring into and out of the wheelchair, folding it, operating the reclining mechanism, and changing batteries.

THE HEMIPLEGIC

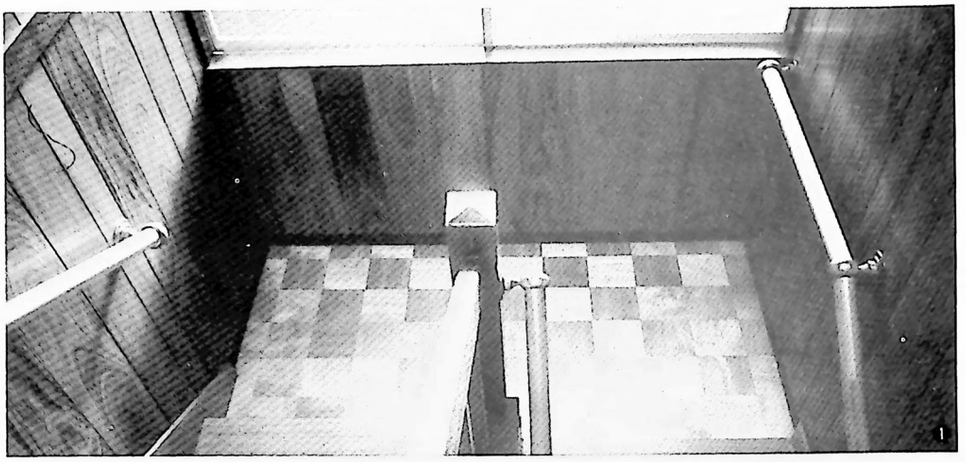
For hemiplegics the major problem is coping with one-handedness, especially when using tools or objects. There are many convenient self-help devices available, of course. But among them, the kinds that are self-stabilizing are most useful for hemiplegics. Devices that can be easily used with one hand are recommended. For those who are hemiplegic on the right side it is a good idea to use devices intended for the left-handed.

Effective training for increased skill in using the unaffected hand can result in the resumption of almost all normal functions. By continuing daily exercise, such as that involved in origami (*paper folding*), or picking up things with chopsticks, the necessary degree of skill can be attained.

Safety, especially for walking, should be the primary consideration in modifying houses or other living quarters for the hemiplegic. For example, there should be few, if any, stairs or steps, and there should be handrails in strategic locations such as the bathroom.

A look at some activities in the lives of two hemiplegics will provide some insights into coping with one-handedness. Mr. Takeo Kobayashi, 57, had a cerebral thrombosis attack 4 years ago, leaving him with right-side hemiplegia. He received physical therapy and occupational therapy at the Tokyo Metropolitan Rehabilitation Center. He now manages his family rubber processing business at his home, devoting most of his time to office work.

Mrs. Hatsuko Abe, 51, is a housewife. She has been a right-side hemiplegic for 3 years. She received some training in homemaking at the Tokyo Metropolitan Rehabilitation Center, and is now continuing her training at her local community training center.

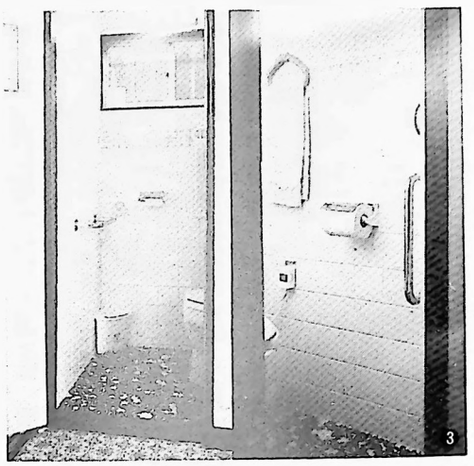


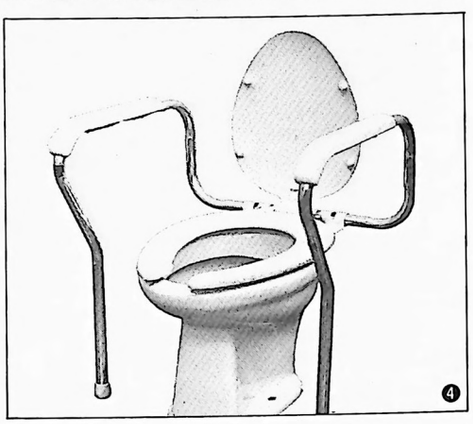
MODIFICATION OF LIVING QUARTERS

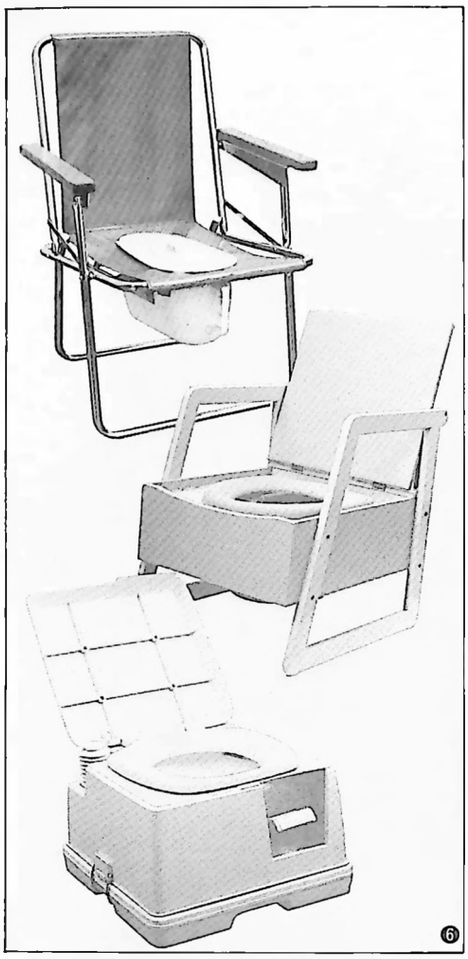
Mr. Kobayashi's house has been modified to suit his particular needs. There are no indoor steps between rooms, and the staircase is not at all steep. The width of the staircase is 180 cm. There are handrails on both sides, and there is a landing *(Photos 1, 2)*.

BATHROOM

Because a person with cerebral vascular disorder must be careful of differences in temperature, he uses a toilet with a seat warmer (*Photo 5*). There is a handrail at a convenient height (*Photo 3*). In the event that the toilet is located some distance away, he uses a portable toilet. It is important to choose one which is stable and has an armrest (*Photo 4*). There are many types of portable toilets available (*Photo 6*).

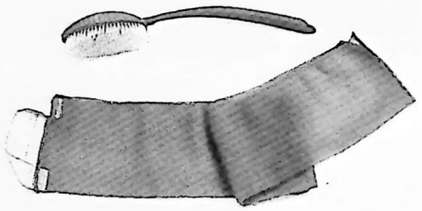






Because Mr. Kobayashi's bath is Japanese-style, there is a small difference in height between the area outside the tub, where the washing and soaping take place, and the tub itself, which is used for soaking afterward. There are handrails at appropriate places, such as the inside of the tub, and a sitting board placed across the top. When getting into or out of the tub, he uses his able side first.

The sitting board is designed to fit stably at the back of the tub (*Photo 7*). To wash himself, he uses a towel with a rubber loop on one side (*Photo 8*). There is also a long-handled brush available for washing. If the handle is made of plastic it can be bent to adjust to the individual needs of the user.



To wring out a towel, it is easier when hung on a faucet.

HOW TO MAKE A SITTING BOARD FOR A BATH

This is useful, stable, and compact, and very helpful for the hemiplegic when taking a bath.

MATERIALS

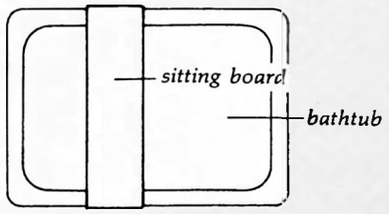
Wood (water-resistant), 1 cm thick or more, 18 to 20 cm wide, length according to individual bathtub.

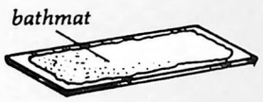
L-shaped metal, 2 pieces, each side 5 cm long or more.

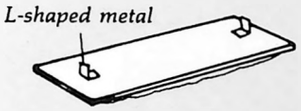
Polyethylene bath mat, same size as the wood.

PROCEDURE

1. Cut the wooden board so that both ends are flush with the outside width of the tub.
2. Draw a line on the underside of the board to mark the inside width of the tub on each side.
3. Make a groove on the center of each of these lines for attaching the L-shaped metal flush with the surface of the board.
4. Attach the L-shaped metal.
5. Place the board on the tub and check for a snug fit.
6. Attach a bath mat to the surface of the board with glue.

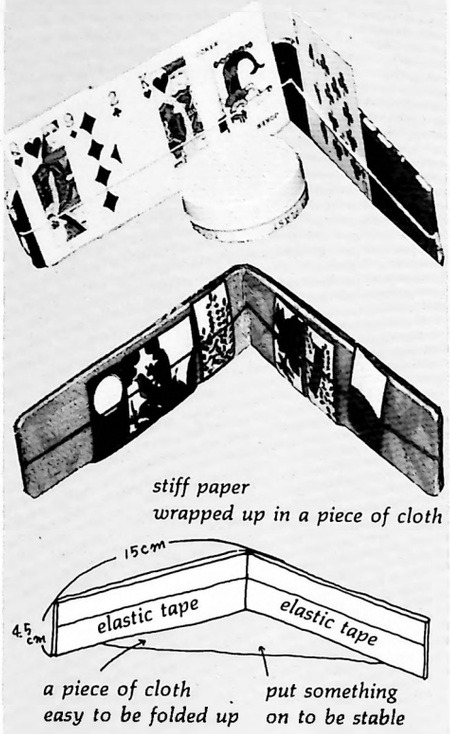






HOMEMADE PLAYING CARD HOLDERS

Playing cards can be held in one hand by using a special holder. It is made of stiff paper, a piece of cloth, and elastic tape. It can be made as shown in the lefthand figure. It is convenient for traveling, since it can be folded up easily.



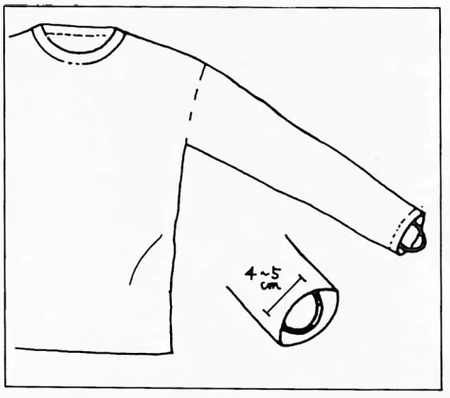
HANDMADE SLIPPER FASTENERS

Toshio Nakamura

Following an attack of cerebral thrombosis, I received physical therapy for one year, then returned to my office. For the most part, I am independent in my daily activities. But I used to have difficulty in keeping my slippers on. Then I devised a solution, consisting of two clips and an elastic tape, 1 cm × 20 cm. The tape is attached to the clips, which are then fastened to each side of the slipper shown below. The result is quite stable, and the slippers stay on.

DRESSING AND GROOMING

A general rule of dressing for hemiplegics is to put the affected arm through the sleeve first. This should be reversed when undressing, with the unaffected arm pulled through the sleeve first. When this is followed, hemiplegics should have little or no trouble dressing or undressing. To prevent shirtsleeves from sliding up when the jacket is put on, a small elastic loop can be attached to the shirtsleeve cuff of the unaffected arm, and the thumb can hold the loop down when the jacket is being put on. Buttoning and unbuttoning garments and knotting ties can be done in the same way as quadriplegics do it.



Clipping the fingernails of the unaffected hand can be difficult. One way to make it easier is to place a large clipper in the palm of the unaffected hand, and depress it with the support of the other fingers. Another way is to use the pressure of the foot while seated. The clipper is placed on the floor, and positioned under the edge of the shoe. Some of the same methods that quadriplegics use are also suitable.

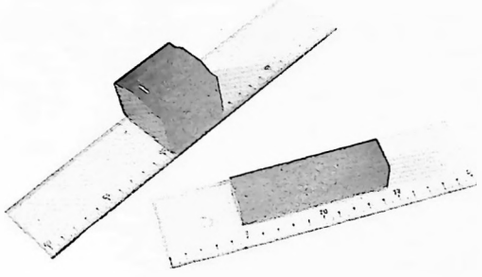
A RECORDER FOR THE HEMIPLEGIC

by Hiroshi Furukawa

A major concern of upper extremity-disabled children and their parents is the resultant difficulty in playing the recorder, a basic component of music education in Japanese primary schools. To meet this need, the Tokyo Metropolitan Prosthetic and Orthotic Research Institute developed for testing a recorder for those with the use of one hand. We found that recorder to be almost like a standard one in appearance, inexpensive, and simple to play. Subsequently, it was improved upon by Yamaha, Ltd. It can cover two octaves and can produce semi-tones accurately. Both right or left-handed ones are available. The degree of functional disability is first checked for each potential user, and where it is considered possible, special training is then required.

WORK

A paperweight is a useful device for the hemiplegic. It can hold papers if the affected hand or arm cannot.



HANDMADE PAPERWEIGHT WITH LIFTING STRAP

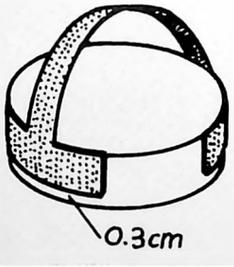
This can be used quite easily by a person with little or no gripping power, and those with the use of one hand find it helpful for holding things together or for exerting pressure.

MATERIALS

A paperweight used for drafting.
Leather, pre-dyed and of uniform thickness.
Glue.

PROCEDURE

1. Cut the leather as in the illustration.
2. Glue the leather to the paperweight.



HOMEMAKING

SEWING

Threading a needle with one hand can be done by first sticking the needle into a pincushion and steadying the hand with the fingers that are not holding the thread (*Photo 9*). Photo 10 shows a device for threading a needle. When sewing with one hand, a paperweight is placed on the cloth opposite the normal hand, and the cloth pulled under it.

To push an elastic string or tape through an article of clothing, there is a special tool with a ring for attaching a clothespin. A paperweight is placed at the other end of the garment, and the tool is pushed through with the aid of the clothespin (*Photo 11*).

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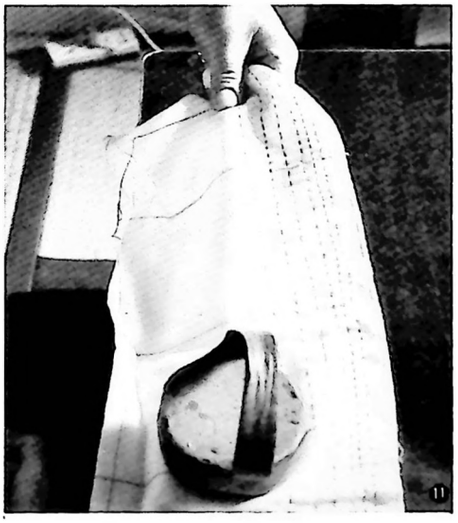
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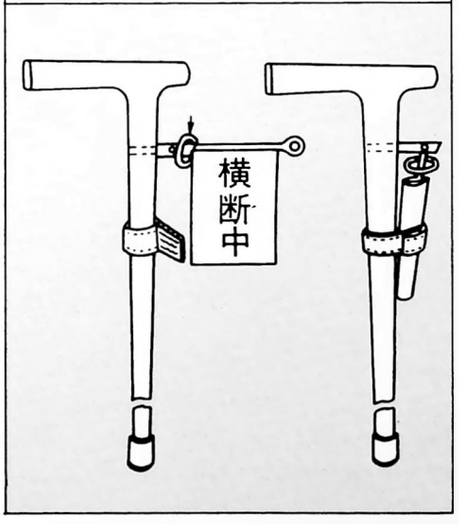
HANGING LAUNDRY

When hanging laundry on a clothesline or pole, clothespins should be used. If a frame is used for drying, clothes can first be attached with clothespins while the frame is resting on a table.

HANDMADE CRUTCH WITH A FLAG

by Motoharu Iida

After a cerebral vascular attack I became a right-side hemiplegic. Two years later I was able to walk again, but crossing streets was a problem. I needed some way to alert drivers to my condition. So I devised the solution shown in the photograph. Most of the time I keep the flag folded and held to the crutch with Velcro. When crossing streets, I open the flag, spread it, and stabilize it with a ring.



There are many kitchen gadgets for one-handed use on the market. While these are very convenient, they are not essential for efficient and economic food preparation. For example, vegetables or tableware can be washed by crowding them into the corner of a sink or the bottom of a dishpan, and scrubbing with a pot cleaner (*Photo 13*). A brush with suction cups on the base is an indispensable aid, especially for washing glasses (*Photo 14*). A special peeling or cutting board is helpful for preparing vegetables (*Photos 15, 16*), but not essential. When round-shaped foods are being peeled, they should first be divided in two, then peeled from the tops with the cut ends down (*Photo 17*).

To peel vegetables whole before cutting, steady them on the chopping board with other fingers while using the peeler (*Photo 20*).

A small-sized kitchen knife is safe and easy to use. Photo 12 shows a very useful multi-purpose slicer. It can be used for fine slicing and for grating as well (*Photo 18*). There is a tool for chopping (*Photo 19*), but the vegetables become very watery. It is better to chop vegetables with the multi-purpose slicer instead. An electric multi-purpose slicer is also available.

Opening cans and bottles can be a problem. To open screw-on type lids, pressing the bottle against the stomach and turning with the thumb and index finger works (*Photo 21*). It is also convenient to have a wall-mounted lid opener (*Photo 27*). When a bottle opener is used, the bottle can be put in a drawer, then the drawer closed with body pressure (with the top of the bottle sticking out of the drawer). Then the bottle opener can be used from the near end (*Photo 28*). An electric can opener is very efficient because any size or shape can may be used, and it is very safe (*Photo 22*).

A cooking basket is usually used for frying potatoes, but it is convenient for frying noodles too. The basket is put in the pan, and the noodles are placed in the basket and cooked. When the noodles are ready, the cooking basket containing the noodles can be lifted out (*Photo 25*).

For frying, a flat-bottom wok with a handle and a wire whisk-spatula can be used (*Photos 29, 30*). The wok is deep enough to be used efficiently, and the flat bottom makes it very safe. There is a special whisk that can be operated by pushing the handle. When this is used with a suction-held mixing bowl, mixing or beating can be done easily with one hand (*Photo 26*).

When these convenient devices are wisely used, cooking with one hand can be quite efficient. When the challenge of stabilizing the foods and the vessels is solved, the rest is easy.

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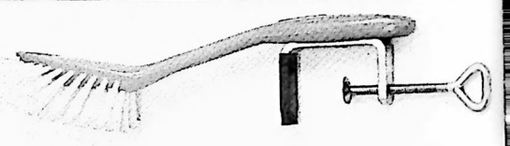

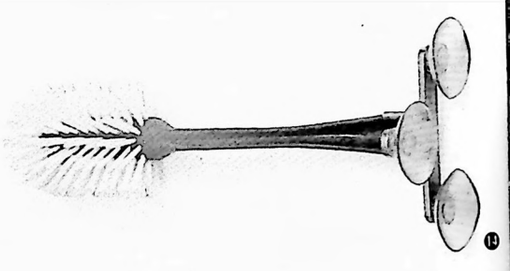

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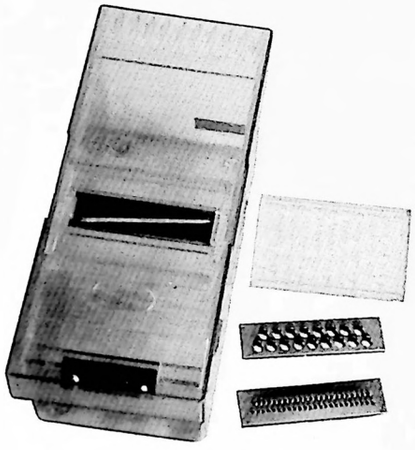

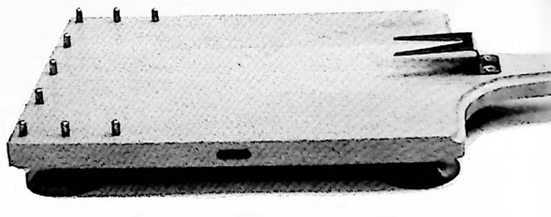

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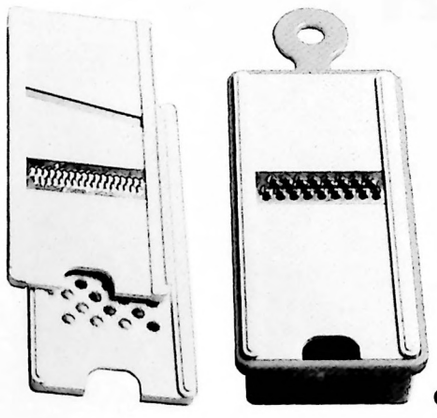

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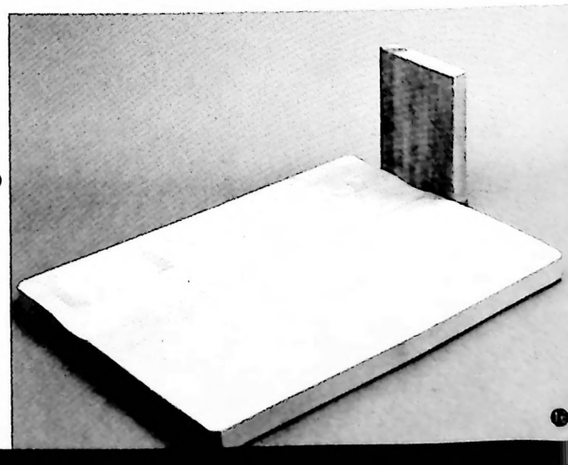

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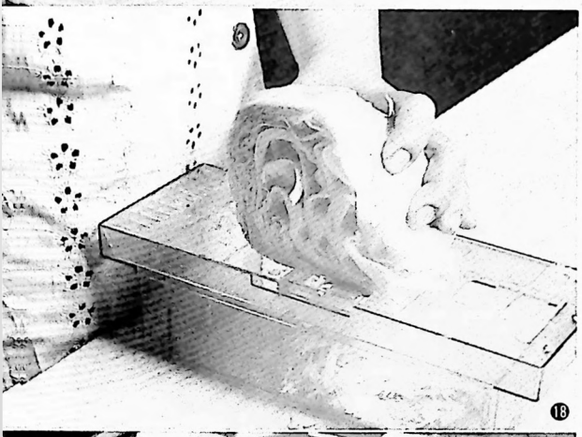

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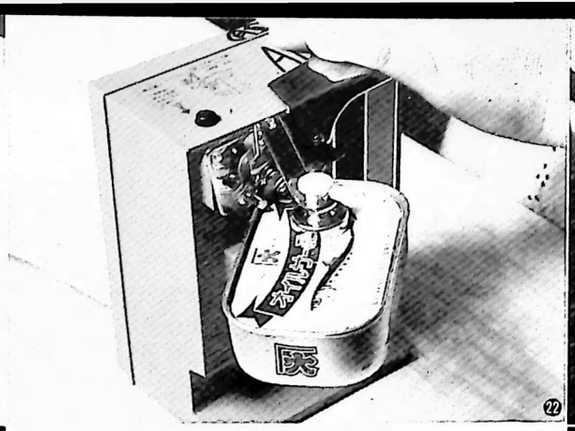

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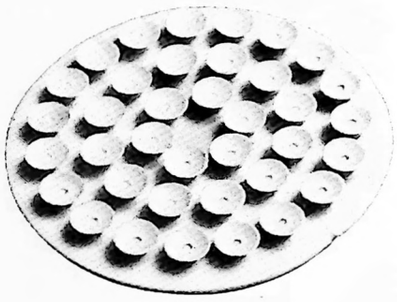

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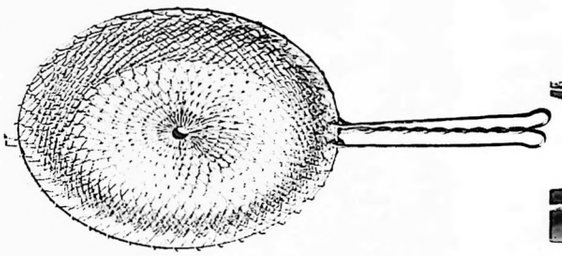

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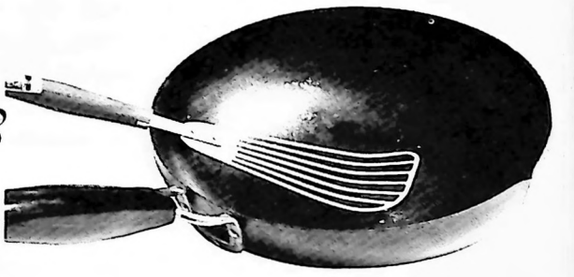

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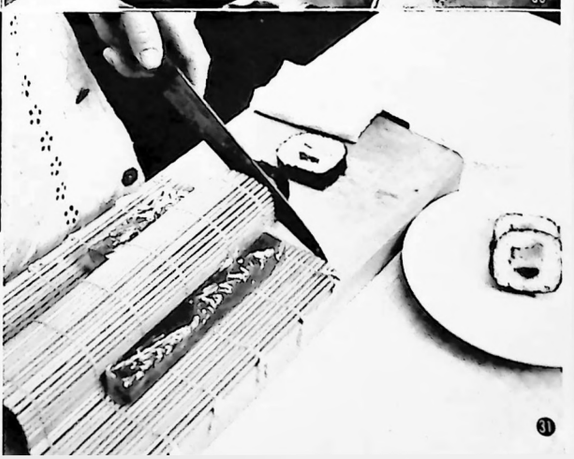

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IMPAIRED USE OR ABSENCE OF BOTH ARMS

People with impaired use or absence of both arms can still carry on most routine daily activities unaided, as long as they have normal function of both legs. Prostheses have been the traditional solution. But prostheses are not without problems. Therefore, at present the use of the lower limbs to replace the arm functions seems to be a more practical solution. Ideally, the greatest efficiency in using the legs and feet to replace hand and arm functions is achieved when training is begun from early childhood. That way, greater flexibility of the hip joints and of toe movements is possible.

This solution to the problem of lack of upper arm function can also be used in case of severe cerebral palsy when the lower limbs are not so impaired. But there will be some problems in terms of speed and degree of skill. Some modification of living quarters and the use of self-help devices are inevitable.

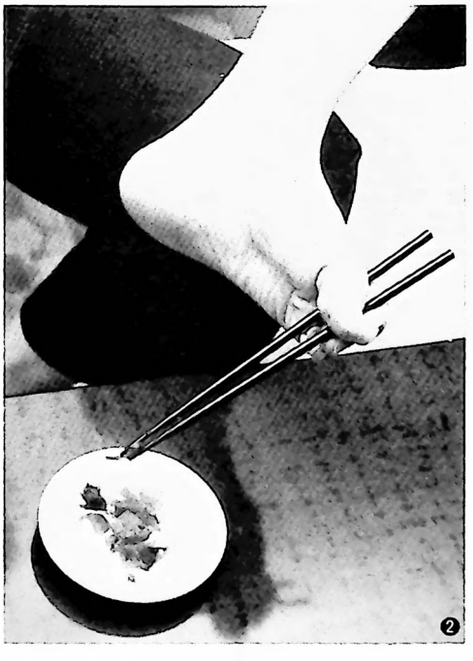
There are few devices on the market which can be manipulated by the limbs alone. Therefore those that are intended for use by the hands must be modified so that they can be used by the legs and feet.

Mr. Kenichi Osuki, 39, was born without lower arms. He is a vocational counselor for the disabled. He performs all of the routine daily tasks by using his legs and feet. He does this easily, with speed, skill, and grace. The following photographs demonstrate some of Mr. Osuki's techniques.

EATING

The height of the dining table should be lower than usual. Slightly lower than knee height (when seated) would be most suitable.

Chopsticks, spoons, and forks are held by the toes of the dominant foot, which is crossed over the knee of the other leg (*Photos 1, 2*). The chopsticks are held with three toes instead of two for more stability. The feet, of course, must be kept very clean.



DRESSING

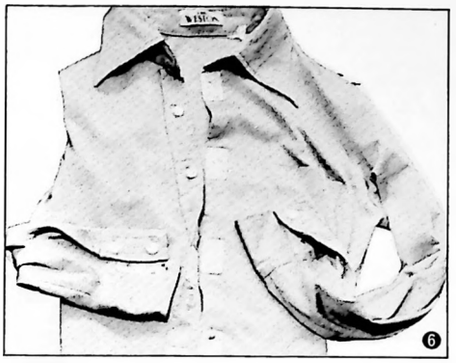
When putting on a pullover type shirt, it is first pulled over the head as in Photo 3. Then the trunk is rotated quickly several times to pull the rest down into position. If this does not work, the bottom of the shirt can be pulled down with the toes (*Photo 4*). For taking a shirt off, the upper body is bent forward and rotated quickly several times to force the shirt up to the neck. Then it can be removed by pulling the back of the collar by the toes (*Photo 5*). Cardigans can be put on and taken off in the same way if they are buttoned up first.

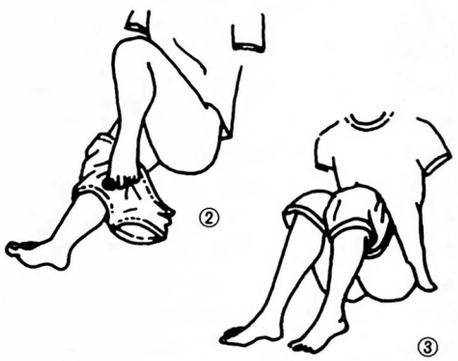
Loose-fitting large-sized boxer type undershorts are more suitable than briefs. Loops should be attached to the front and back of the waistband, and to the back of the leg hems (*Figure 1*). Pants are put on by sitting on the floor, putting the legs through one at a time, then standing up (*Figures 2, 3*). The waist loops are then hooked onto hooks that are attached to the wall at a height midway between hip and knee (*Figure 4*). Then both knees are bent to a squatting position in order to pull up the pants by the hook (*Figure 5*).

Pants are taken off by standing on one foot, bending the opposite knee, and pulling them down by hooking a toe through the loop (*Figure 6*). Then the same is done with the opposite leg.

Because neckties are difficult to knot with the toes, snap-ties or pretied ones should be used.

Shirts are most conveniently fastened with Velcro (*Photo 6*).



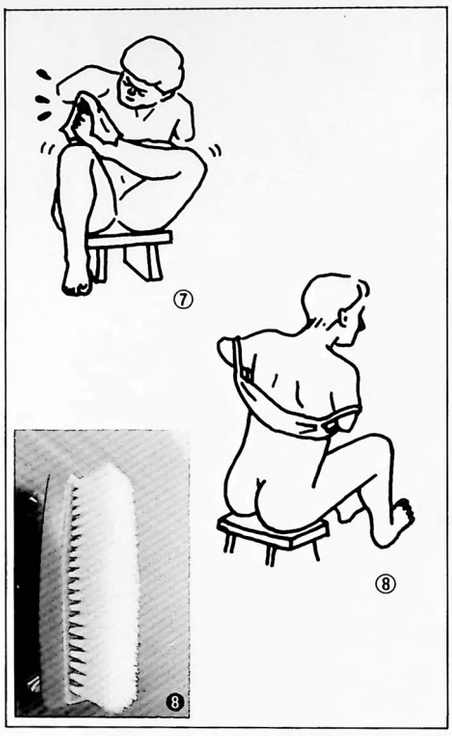


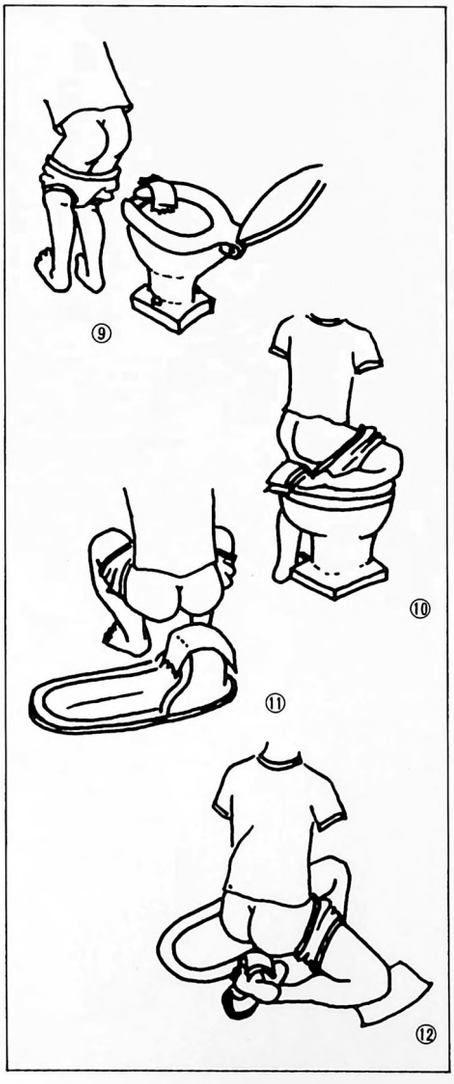
PERSONAL HYGIENE

Brushing teeth is done by holding the toothbrush with the dominant toes, supporting the foot on the edge of the sink, then moving both the mouth and the brush at the same time. Washing the face is done in the same position (*Photo 7*). Towels can be dried by squeezing them against the side of the sink, hanging them over the faucet, and wringing by grabbing both ends.

Figures 7 and 8 show an all-purpose washing technique. In this position, the towel or washcloth is manipulated by one foot placed on the opposite knee. Both the washcloth and the body are moved at the same time to create scrubbing friction. The back is washed by putting the stumps of the arms through the loops of the towel (*Figure 8*). If there are no stumps, the toes can be used, or the back can be rubbed against a brush which is attached to the wall by means of suction (*Photo 8*).

When using paper with a western-style toilet, one knee is bent over the closed lid. The anus is wiped with a piece of paper held by the toes (*Figure 10*). Another method is to wrap the paper around the toilet seat and move the buttocks against it (*Figure 9*). For Japanese-type toilets the methods are similar (*Figures 11 and 12*).

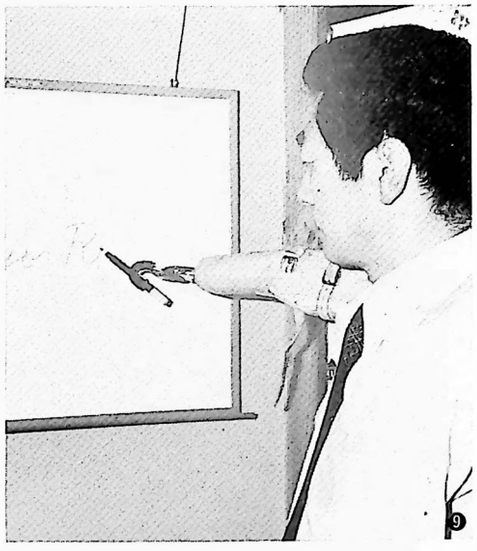




WRITING

The most important factor in writing for people who do so with their feet is the height of the table. It should be the same level as the seat of the chair, or slightly lower. A pencil can be held with the big toe and the next two toes. With proper exercises for dexterity, a pencil holder isn't necessary.

When writing on the blackboard, to an upper-limb prosthesis, using as the one shown in Photo 9 is available, since reaching the blackboard can be difficult. This device is similar to an upper-limb prosthesis, using a hook terminal as a pencil-holding part.



Severe Cerebral Palsy

Miss Sakuko Toyoda, 35, has a severe case of cerebral palsy. Nevertheless, she lives an independent life. Except for some slight grasping ability of the left hand, she has no functional use of the upper extremities. She can walk by herself, although with somewhat jerky movements because of the tenstion athetoid movement that is part of her condition. She can perform most routine daily activities with her left foot, which is the dominant one. Rearranging her furniture and other household items and aids with foot-use in mind has helped her to live more efficiently.

MEALS

It can take as much as an hour or two for her to have a meal. She uses a long-handled spoon and fork (*Photo 13*) which she holds with her left foot (*Photo 12*). A knife has to be secured with a rubber band so it doesn't slip when she holds it this way. Photo 10 shows the use of the long-handled tableware. The mouth must be opened to coincide with the arrival of the food. Getting the timing right takes a lot of practice. There are some other types of spoons and forks for use by the feet available (*Photo 14*).

For drinking liquids, a weighted cup attached to the table with suction, and a bendable straw are used *(Photo 11)*. A wider straw is used for Japanese miso soup or other thick liquids.

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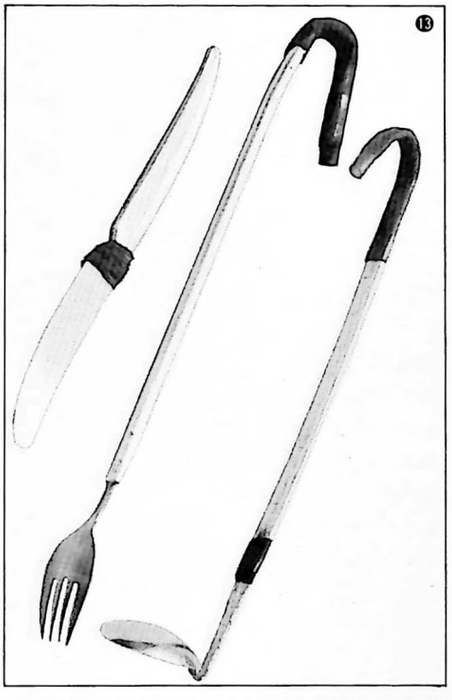
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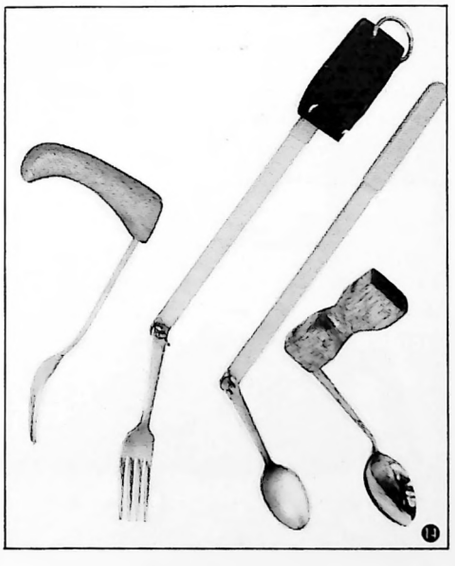
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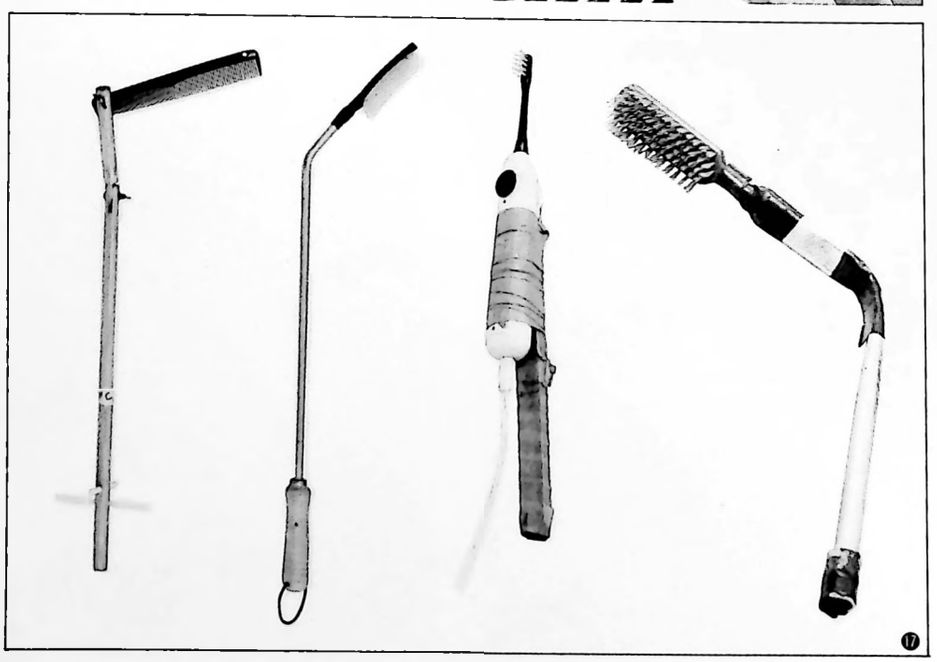
GROOMING

For Ms. Toyoda's use, the sink must be positioned lower than the surface of the floor. A lever-type faucet is easy for her to operate. When she washes her face, she puts a wet towel on a table, and rubs her face on the towel.

She uses an electric toothbrush, as shown in Photo 15. The handle is weighted with a heavy stick and placed on the edge of a suitable table. Once the brush part is in the mouth, the switch is turned on. Repeated practice is needed to overcome the athetotic movement of face and mouth movements and coordinate with the vibration of the brush.

Because she is unable to use nail clippers, she uses sandpaper instead. This procedure takes much more time than the usual methods, but it is essential for her to keep her nails filed short, and it works.

Brushing her hair is done with a long-handled brush. A part of the handle near the bristles bends for flexibility while using the brush, which is done by holding it with her left foot and moving her head against the bristles (*Photo 16*). Other long-handled brushes are modified according to individual needs. One of these, and a comb, are shown in Photo 17.



CLOTHING

Pants, skirts, and socks are much easier for her to put on than upper-body garments. She can wear dresses if they are simple pullover styles, in large sizes with elasticized waists. She can put them on herself, although it takes more time than usual. Changing underwear every day would be very time-consuming, so she usually does it twice a week, after taking a bath.

Because pulling her pants down and up in the narrow confines of most toilet areas is difficult, she usually does this outside the small toilet room. She now uses a "shower toilet."

SHOWER TOILET

With this toilet, it is possible to clean oneself after excretion without the use of toilet paper. Instead, a pedal or button is pushed, and a nozzle extends automatically and bathes the anus with warm water. Then hot air dries the wet area. The hot air can also be changed to cold air (*Photo 18*).

HOUSEKEEPING

Scrubbing the floor is done with a chemically-treated cloth handled by her left toes in a sitting position. Only a dry cloth is used, because a wet one is likely to leave the floor slippery. Dust is swept with a small electric cleaner manipulated by foot (*Photo 19*).

Washing is done with an automatic washing machine. Consideration should be given to the height of the machine in order for her to be able to reach the dials with her foot. Miss Toyoda's washing machine is 40 cm below floor level. As it is still too high for her to reach, she operates it from a chair (*Photo 20*). The wash is pulled out with a reacher.

A clothespole is set at a lower height than usual so she can handle it with both feet. Big items such as sheets are too difficult to handle, and have to be sent to the laundry.

Miss Toyoda is able to cook simple dishes by herself. The sink is 30 cm by 71 cm in size and the bottom of it is 15 cm lower than the floor. Cupboards and other furniture are also low in height, as seen in Photo 21. Reachers are used as in Photo 22.

She usually uses a one-handled pan, but has a two-handled pan for boiling. One of the handles should be a long one so that she can grasp it with her foot (*Photo 23*). She can thus lift it without spilling the contents.

For opening cans, a flat wooden board with a leather strap is used. The can is placed inside the strap and twisted to one side (*Photo 26*). Nails driven through a cutting board can help stabilize the food being sliced or chopped (*Photo 27*). A kitchen knife is used with the foot, as in Photo 24. These and other cooking devices can also be used by hemiplegics (*like Photo 25*).

THE PARAPLEGIC

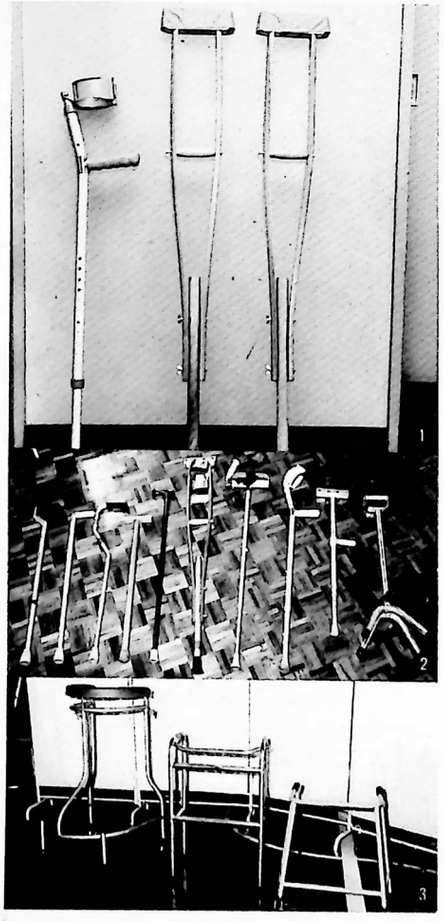
Paraplegics can use several methods for moving about depending on the degree of their disability. The devices need to be selected carefully, and the living environment modified accordingly.

CANES AND CRUTCHES

Canes and crutches are selected to suit the functioning of the lower extremities. Crutches or the Loftstrand cane are the ones most commonly used (*Photo 1*), but there are many other kinds (*Photo 2*).

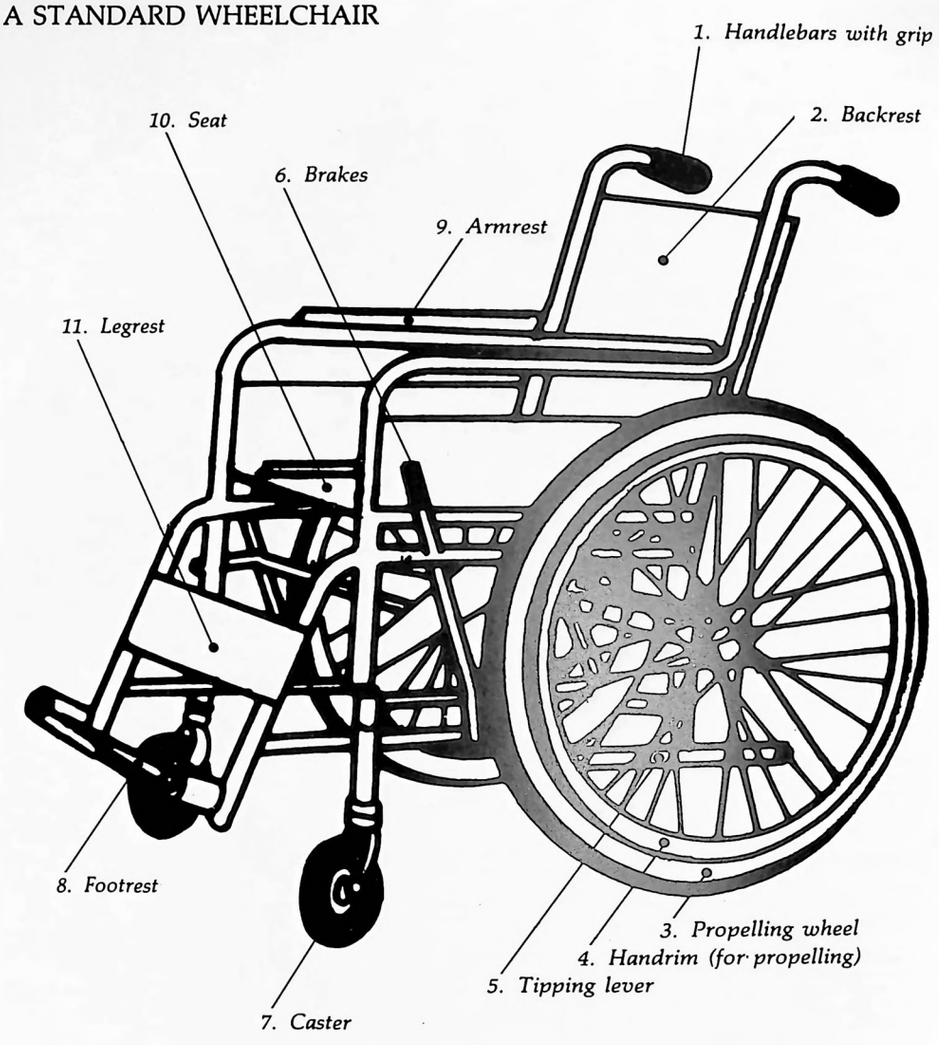
For those who are unable to support themselves with crutches or canes, walkers are available for indoor use (*Photo 3*).

When using a pair of crutches, both hands are occupied, making it difficult to carry a bag or an umbrella. Raincoats and hats can be helpful. If there are small things to be carried, a bag can be attached to the crutches.

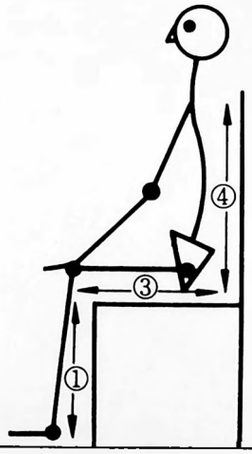


WHEELCHAIRS

COMPONENTS OF
A STANDARD WHEELCHAIR



WHEELCHAIR
MEASUREMENTS



1. Height of the seat: distance from the floor to the back of the knee when seated.
2. Width of the seat: width of the hip plus 5 cm.
3. Depth of the seat: distance from the back of the hip to the back of the knee minus 5 cm.
4. Height of the backrest: distance from the seat of the chair to the armpit minus 10 cm.
5. Height of the armrest: distance from the seat of the chair to the elbow.
6. Height of the handrim: distance from the armpit to the thumb (*with elbow flexed 150 degrees*).
7. Height of the footrest: about 5 cm from the floor.

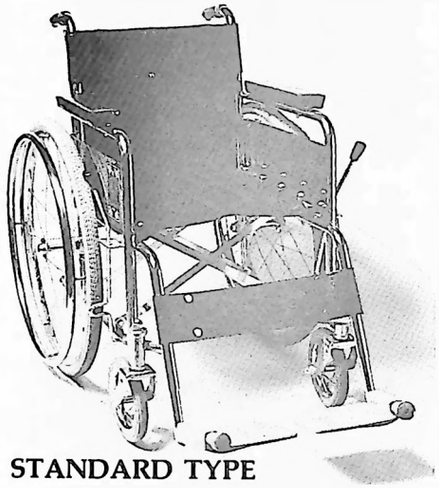
TYPES OF WHEELCHAIRS

3. DESK TYPE

This wheelchair is designed so that its armrests can fit under a desk.

6. ONE-HAND DRIVE TYPE

This type is meant for hemiplegics. It takes some skill to operate.



1. STANDARD TYPE

This is the most commonly-used and the most practical type of wheelchair. It can be propelled by oneself.

4. RECLINING TYPE

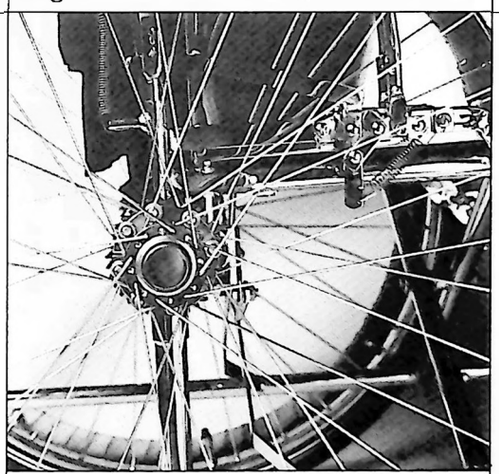
This type is indicated for those unable to maintain an upright position while seated, and needing the legs elevated as well.

7. SPORTS TYPE

This type is lightweight and sturdy, and it is used for sports. It has no extra equipment, just the basic essential parts.

2. TRAVELING TYPE

This type requires less space for turning, can go up stairs if they are not too steep and can be used indoors and outdoors. But it is difficult for an attendant to assist with.



5. BACK-GEAR TYPE

This has a stopper attached to prevent the wheelchair from sliding backward when climbing a slope.

8. GLIDER TYPE

When it can be operated by oneself, the footrest is not necessary. If someone is to push it, the foldable footrest should be extended and used.

THE GLIDER CHAIR

The glider chair is convenient for people with rheumatism, especially when housekeeping is involved. It has no handrim, and is propelled by kicking the floor with the legs.

WHEELCHAIR SELECTION

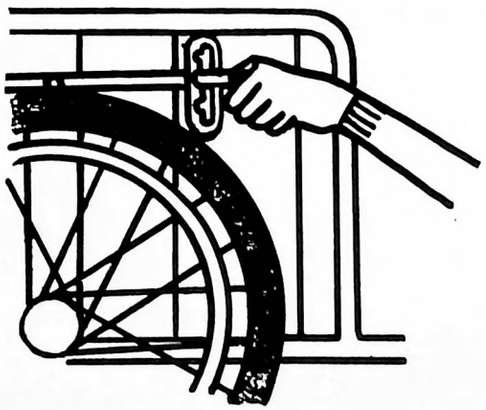
Selection of a wheelchair should involve consideration of:

1. Degree of disability and physical condition.
2. Safety, especially the brake system. For example, the wheelchair can have a brake attached to the handgrip for the attendant.
3. Weight of the wheelchair in terms of ease of transfer to a car, and other related factors.
4. Appearance. The feelings of the disabled about the appearance of the wheelchair must be considered.
5. Cast. The wheelchair must be checked regularly for safety. It is essential that it be maintained in excellent condition with the wheelchair running on a level surface, if there are zigzagging movements, vibrations, or unusual noises, the casters, wheels, and screws should be checked.

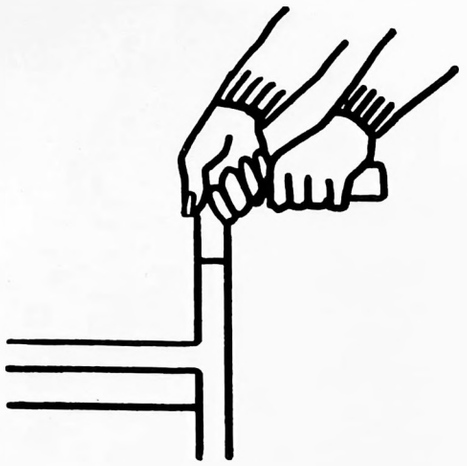
CHECKING OF WHEELCHAIR

The wheelchair must be checked regularly for safety. It is essential that it be maintained in excellent condition.

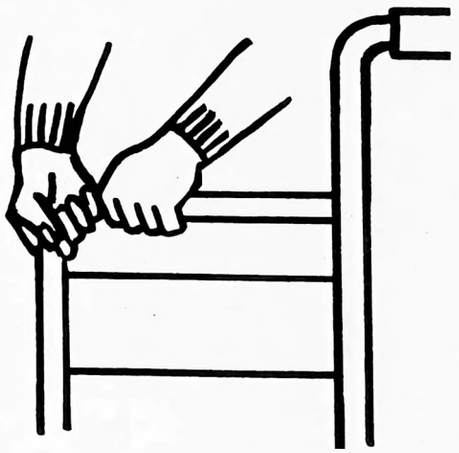
1. Checking the brake.



2. Checking the handgrip connection.



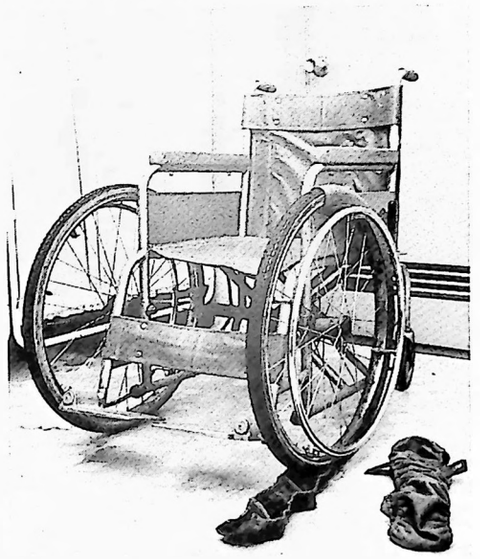
3. Checking the backrest, armrest, and footrest connections.



4. Checking the air in the tires.

WHEELCHAIR ACCESSORIES

There are raincoats, gloves and wheelcovers available for use with wheelchairs.



Taken from "Wheelchair": Asahi Shimbun Social Welfare Organization

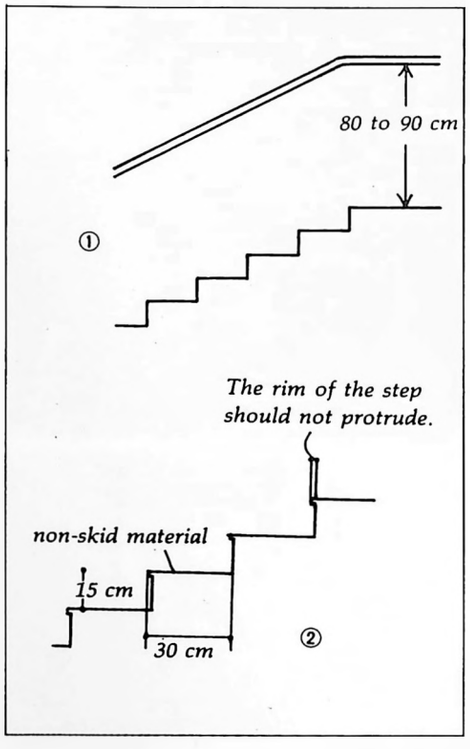
BASIC EQUIPMENT AND MODIFICATION

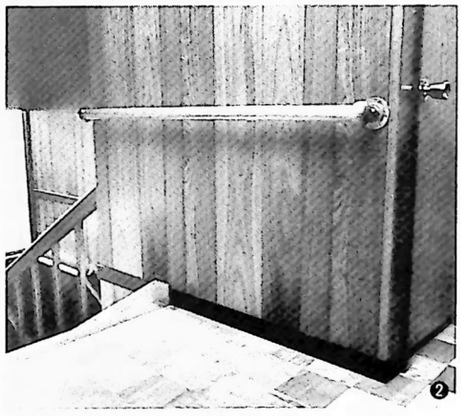
Handrails are important for those who use wheelchairs or crutches. The placing of handrails at all necessary locations makes it much easier for them to move about unaided.

STAIRCASES

The height of the handrails should be in accordance with individual requirements. Somewhere from 80 to 90 cm is usually good (*Figure 1*). Staircases in public buildings may have two handrails parallel to each other, for convenient use by people of different heights (*Photo 1*). Handrails must continue without any breaks at landings (*Photos 1, 2*).
A cane rack located where the handrail starts may be convenient for cane users (*Photo 3*).

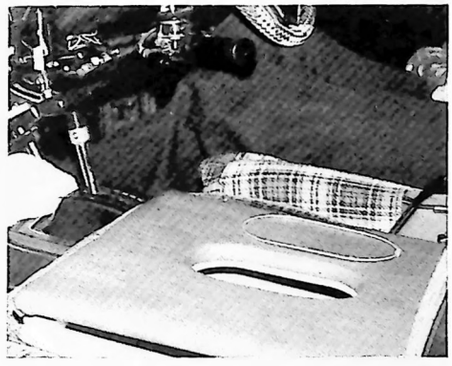
For safety, non-skid materials must be used and there should be a skid guard attached to the edge of each stair. The stairs should not be steep (*Figure 2*).





HANDMADE PORTABLE TOILET FOR USE BY WOMEN IN AUTOMOBILES

This toilet fits onto the front seat of a car, with the back of the car seat reclined somewhat. The surface of the toilet should be flat and stable. The materials needed are wood for the bottom and the surface, a vinyl bag, and a metal ring for holding the bag. The bag can be changed after each use. It can be used quite conveniently while driving because the car affords some degree of privacy.



TOILETS AND BATHROOMS

The most important overall factor in the bathroom is stability. For those who cannot maintain a standing position in front of a urinal, handrails should be provided as in Photo 4. For those who cannot sit comfortably or at all, there should be handrails located on each side of the toilet (*Photo 6*). The position of the handrails may vary according to individual circumstances such as the height of the wheelchair, the way of transfering from the chair, and other factors.

The bathing area requires special attention because of the potential for accidents if the floors are slippery. For those who are unstable when standing, there must be handrails around the room (*Photo 5*). Low mirrors would be convenient for the spinal cord-injured.

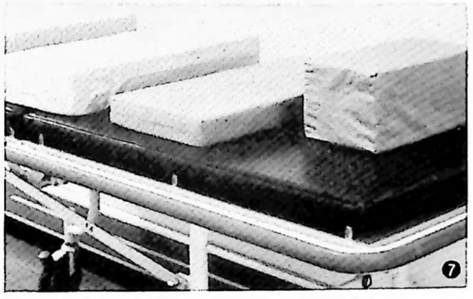
EQUIPMENT FOR GREATER COMFORT

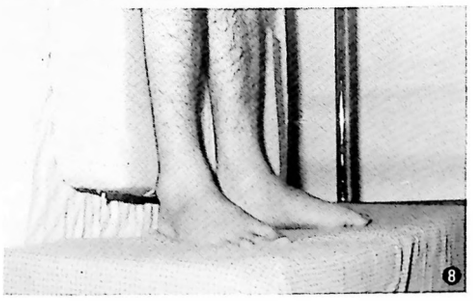
MATTRESSES AND CUSHIONS

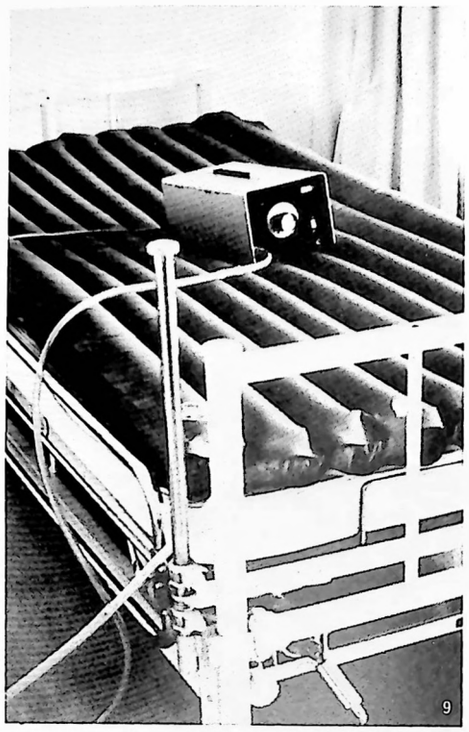
The careful choice or modification of mattresses and cushions is a key factor in guarding against the ever-present possibility of rashes or bedsores. This can be done in several ways:

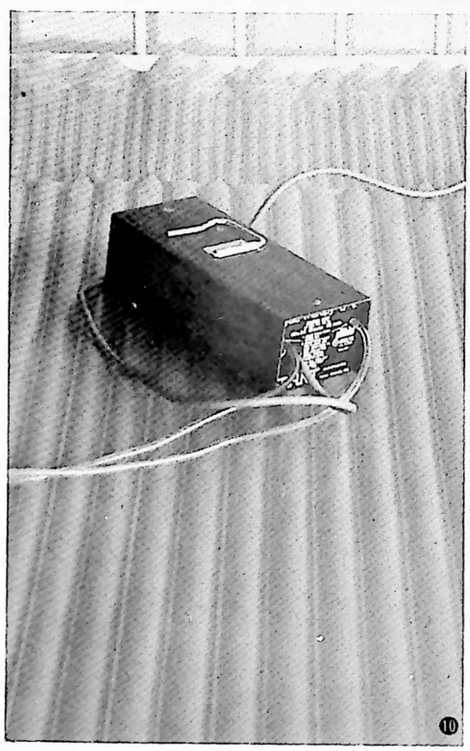
1. Remove the mattress or cushion from direct contact with or from under those parts of the body which are most likely to incur bedsores.
2. Diffuse the pressure to the wider parts of the body.
3. Transfer the weight to different parts of the body periodically.
4. Use materials which can help prevent friction between the body and the mattress or cushion.

Photo 7 shows various sizes of cushions made of polyurethane foam. To prevent bedsores on the heels, for example, foam cushions can be combined for use as in Photo 8. Photos 9 and 10 show two types of air mattresses. These can help satisfy conditions 2, 3, and 4 above, even if not perfectly.









DIAPERS AND DIAPER COVERS

Urinary incontinence among the senile or the severely physically disabled can be a great problem for the individuals and their families as well. The careful selection of diapers and diaper covers can help in terms of comfort and care. The following factors should be considered:

1. TEXTURE OF DIAPERS

The diaper should be highly water-absorbent, and should dry quickly. Flannel, woven-knits, or toweling can be used.

2. PAPER DIAPERS

Although paper diapers have some disadvantages, such as high cost, necessity of finding disposal places, low absorption capacity, and poor ventilation properties, they are convenient, especially when attendants are busy. They can be used together with cloth diapers.

3. DIAPER COVERS

The selection should be made according to individual needs. There are several types:

a. Panties type

For the person with a relatively low degree of incontinence, and who can move about by himself.

b. T-type

For the person who is able to move his body while the attendant is changing the diaper following each occurrence of involuntary urination. Also for the person who cannot move his body at all, and for those who use paper diapers.

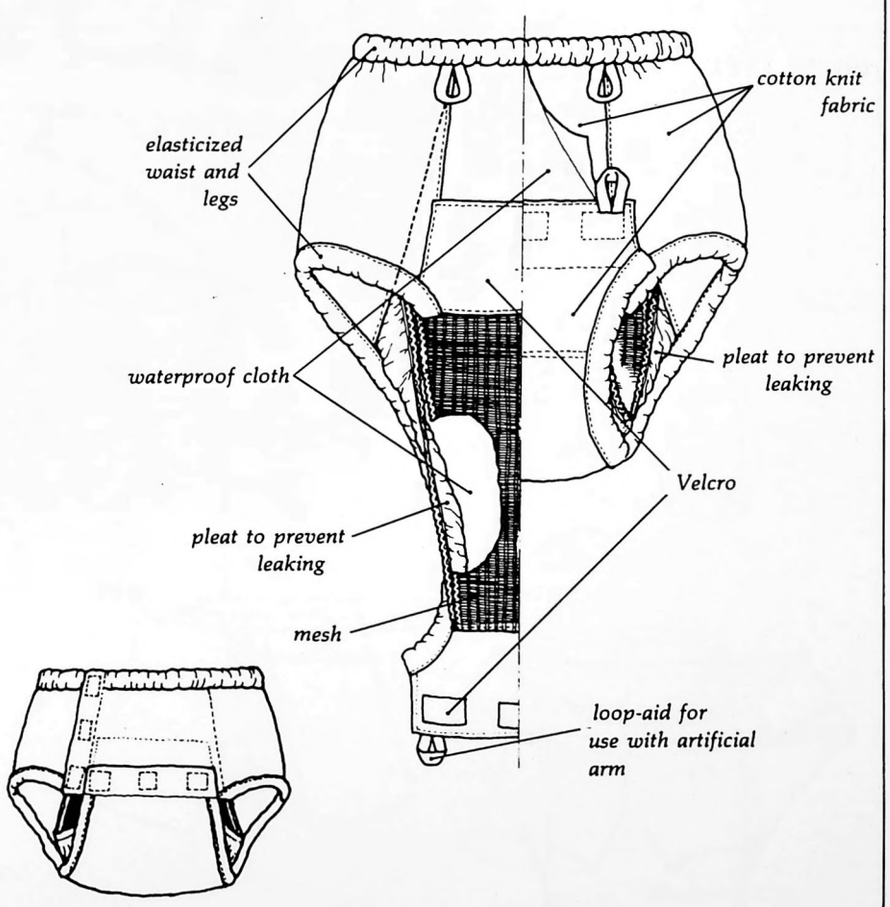
c. Bikini type

For the wheelchair bound.

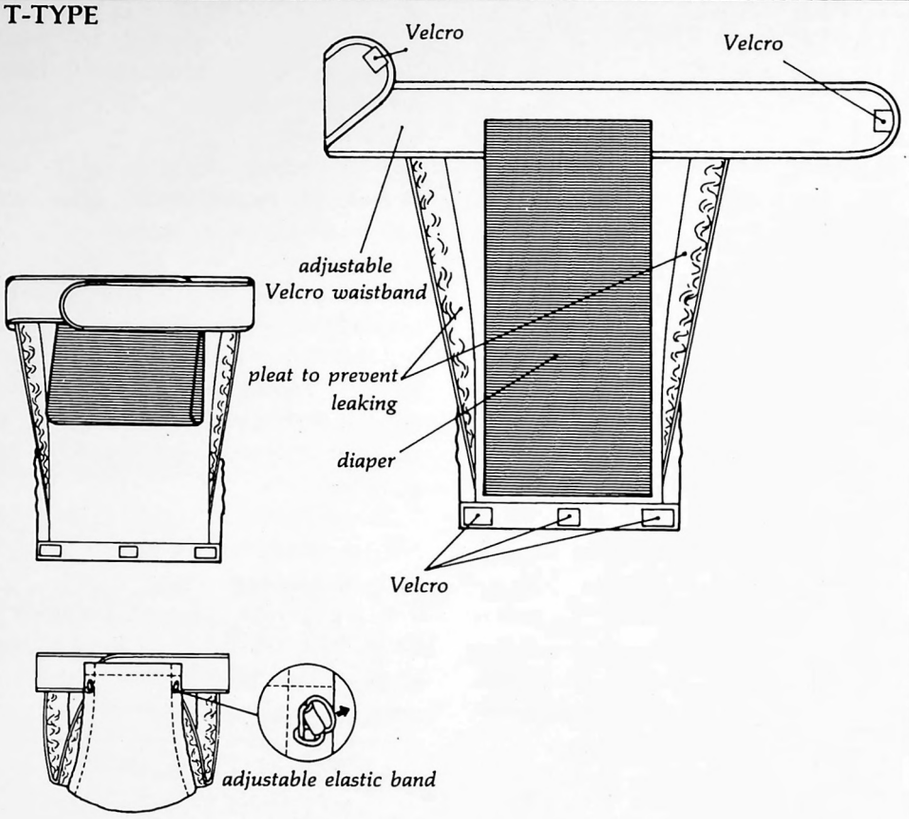
d. Bloomers type

For the person who is completely dependent on others for changing diapers, especially if there is a lot of urine and opportunities for changing are infrequent.

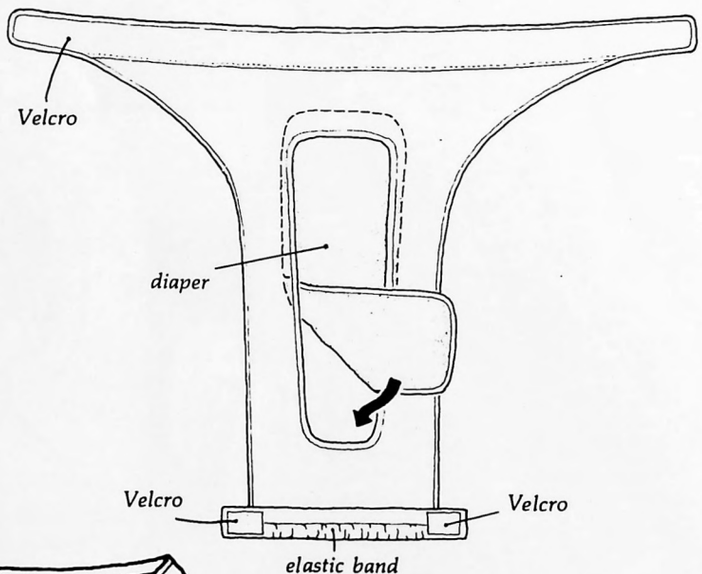
PANTIES TYPE

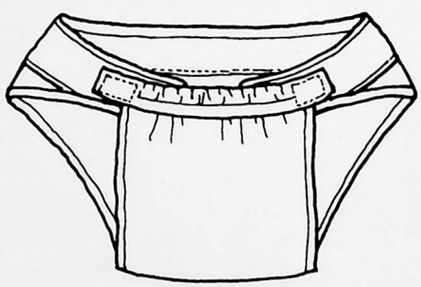


T-TYPE

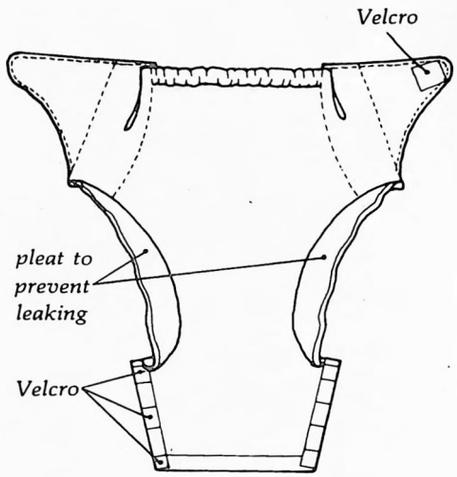


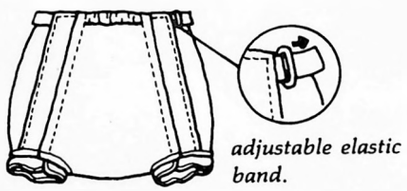
BIKINI TYPE





BLOOMERS TYPE

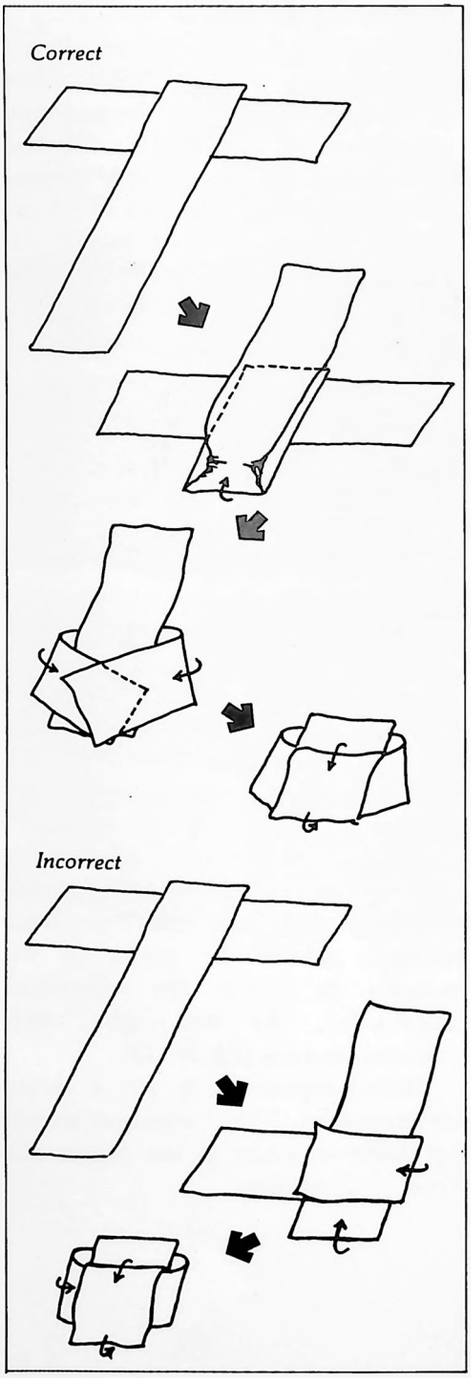




PLACING AND FOLDING DIAPERS

Cloth diapers should be folded into rectangles, as illustrated, to adapt to the appropriate type of diaper cover. The following points should be considered:

1. The part of the cloth which gets the wettest (upper part for males, lower part for females) should be the thickest.
2. There should never be strong pressure on the abdomen.



UNDERWEAR AND SLEEPWEAR

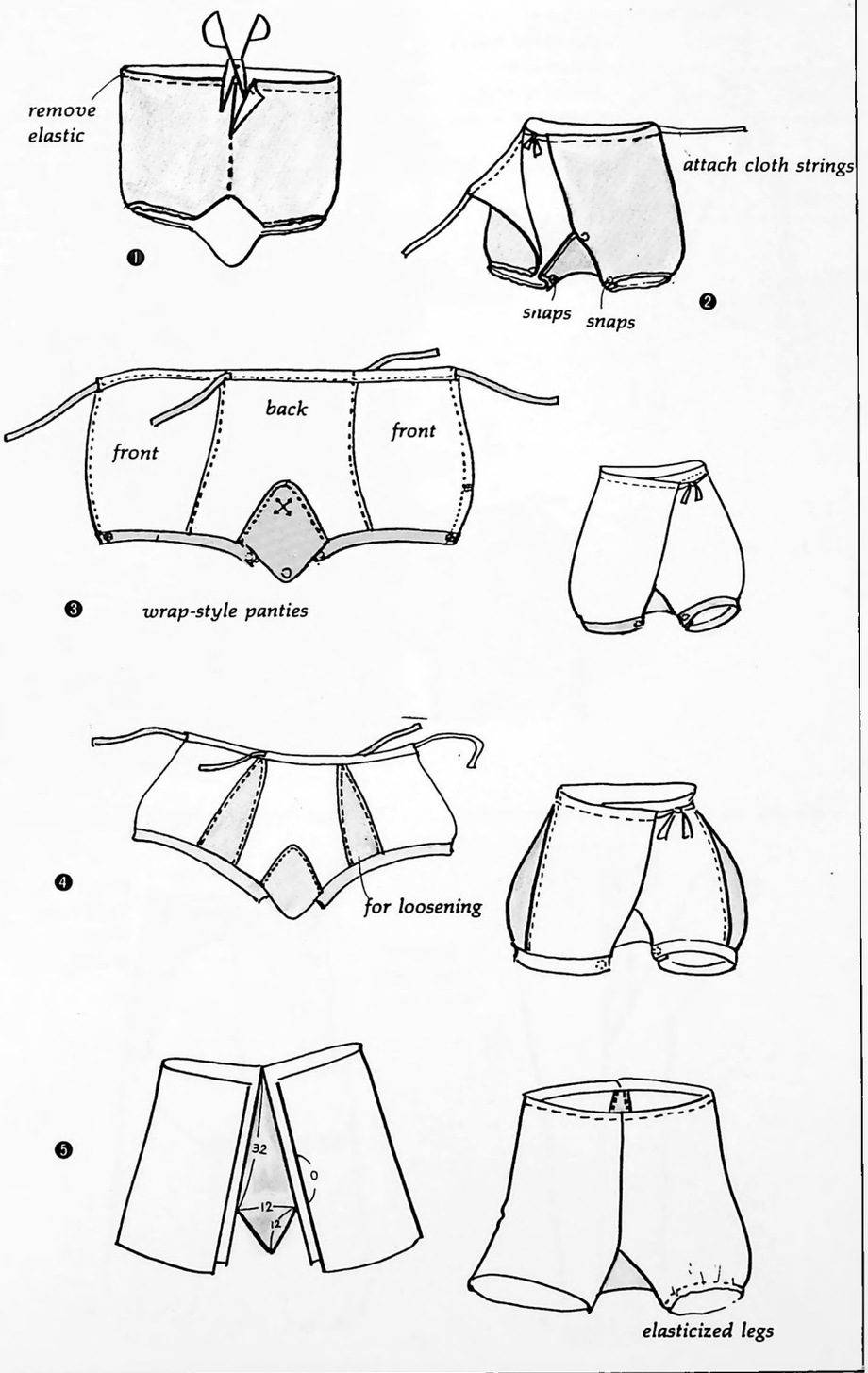
UNDERPANTS

Large-sized or maternity pants should be used. Cut the front to the bottom with a "V" as in Figure 1, then attach snaps to the bottom to close the leg openings, and change the elastic at the waist to cloth strings.

For pajamas, undo the front as in Figure 2, then attach a square piece of flannel or bleached cotton under the thigh part and fasten with Velcro.

Figures 3, 4 and 5 show how to make wrap-style panties.

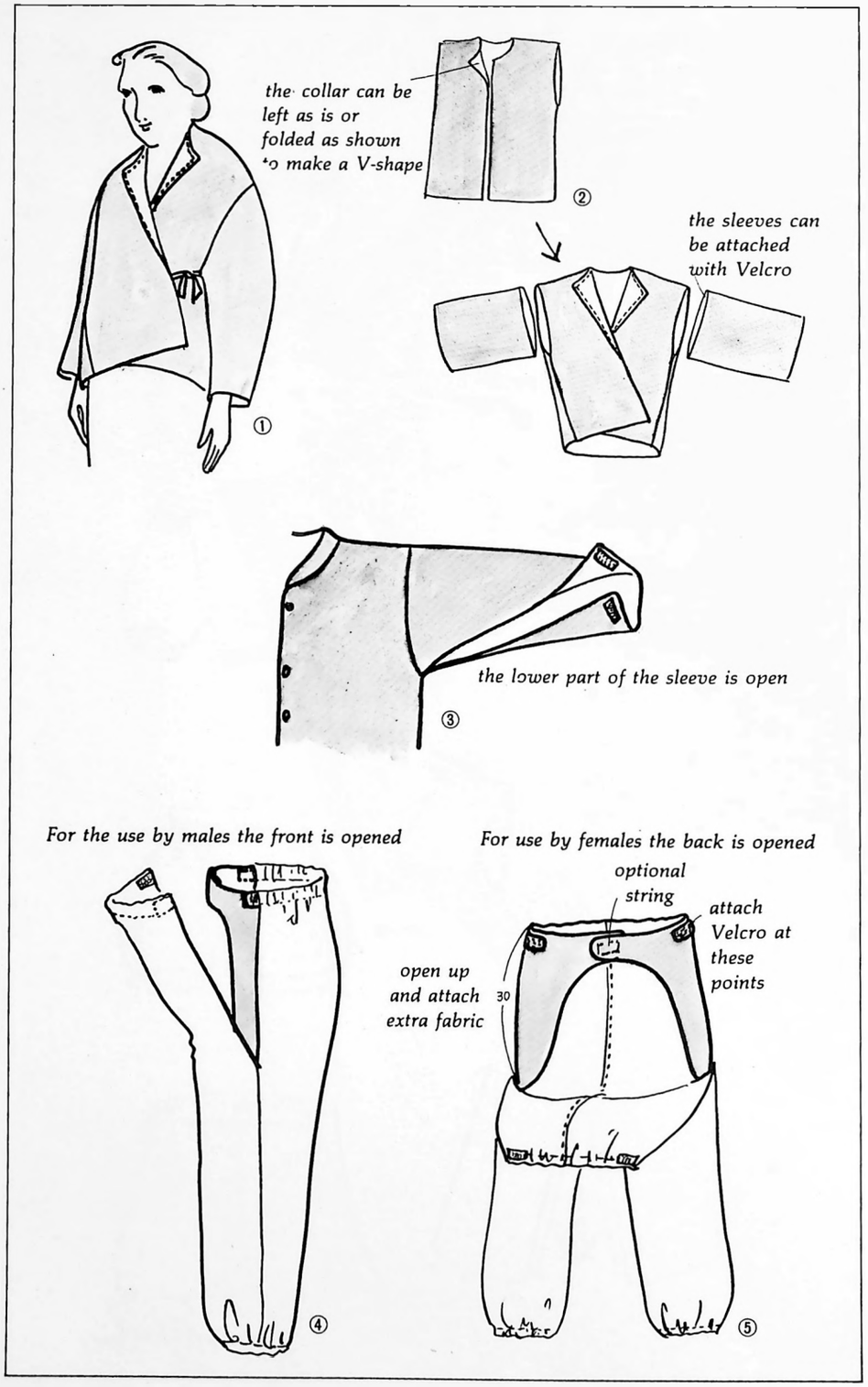
MODIFYING UNDERPANTS



UNDERWEAR

A way of adapting comfortable underwear to individual dressing needs is illustrated in Figures 1, 2 and 3. There can be various changes, such as location of the openings, according to individual requirements. The important thing is to enable the person to dress and undress with ease.

Figures 4 and 5 shows pajama pants. Male pants can be opened down the front, while female ones are opened at the rear.


the collar can be left as is or folded as shown to make a V-shape
②
the sleeves can be attached with Velcro
①
the lower part of the sleeve is open
③
For the use by males the front is opened
For use by females the back is opened
optional string
attach Velcro at these points
open up and attach extra fabric
30
④
⑤

RESIDENT HOMES FOR THE DISABLED

BEDS

There are two crucial factors, beside sleep, that must be considered in providing beds for the disabled. One is the necessity for performing various self-help activities on the bed, and the other is convenient access for the attendants. Suitable beds should be chosen with these factors in mind.

HEIGHT OF THE BED

For the second factor above, attendant assistance, the best height from the floor to the top of the mattress is between 60 and 65 cm. On the other hand, for factor one above, self-help activities, a height of 45 cm is best. This is a good height for transferring fromthe bed to the wheelchair. Since the mattress is usually 10 cm thick, the actual height of the bed is 35 cm.

MATTRESSES

The selection of mattresses is also a key factor. The most widely-used materials are: 1. springs; 2. polyurethane foam; 3. coconut fiber and 4. others.

The mattress with springs is the one most commonly used because of comfort and good ventilation qualities. But more rigid ones, like those of the coconut fiber type, are more stable for sitting up in bed (*Photos 11, 12*).

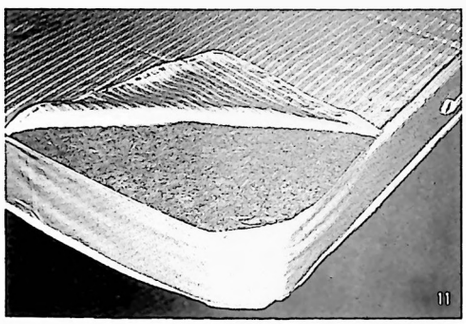
Table 1 shows the relationship between bed structures and physical disabilities. When selecting beds, thought should be given to the manner in which the wheelchair approaches the bed, and other relevant factors (*Photo 13*).

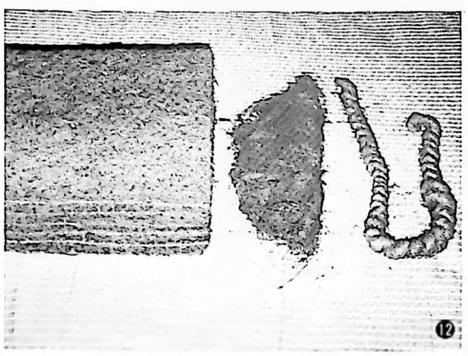
Multi-purpose beds are a recent development. Their selection should be made in terms of the degree and type of disability.

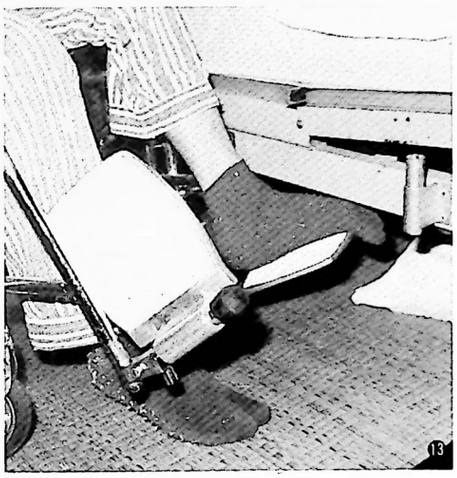
Table 1: **Suitability of Beds**

	Bed	Muscular Disease	Balance Disfunction	Peripheral Nerve Paralysis	Cerebral Palsy	Quadri-plegia	Paraplegia	Hemiplegia	Amputation	Mal-formation
Bedridden: can sit up unaided	height (including mattress)	45 cm	45	45	45	45	45	45	45	45
	necessity for jointed mattress base (gatch spring unit)	none	none	none	none	none	none	none	none	none
	necessity for modification of attachments	yes	yes	yes	yes	yes	yes	yes	yes	yes
	width (W-wider S-standard)	S	W	S	W	W	S	W	S	*
	mattress	palm	palm	*	palm	palm	*	palm	*	*
Bedridden: prone	height (including mattress)	65 cm	65	65	65	65	65	65	65	65
	necessity for jointed mattress base (gatch spring unit)	yes	yes	yes	yes	yes	yes	yes	yes	yes
	necessity for modification of attachments	*	*	*	*	*	*	*	*	*
	width (W-wider S-standard)	S	S	S	S	S	S	S	S	S
	mattress	spring	palm	*	palm	* *	* *	spring	*	*

*depends on individual need **air mattress and palm or spring. Note: "palm" is coconut fiber.







CHAIRS

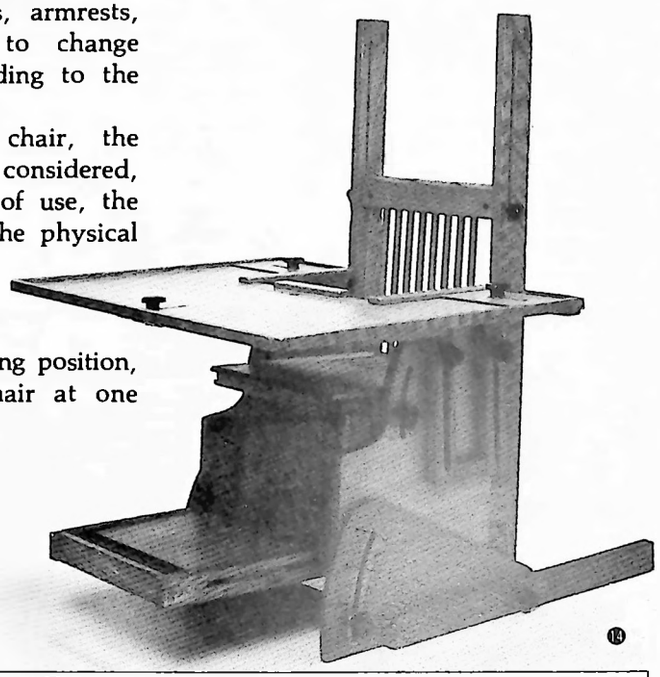
The Figures show chairs mainly suitable for cerebral palsied children. They can be used for toilet activities as well as for eating. The position maintained while sitting in these chairs aids in relaxation and freedom of use of the hands. Types of chairs are shown below:

1. Standard type with adjustable seat and footrests.
2. For use with Japanese-style tables, not suitable for older children.
3. For use with the dining table.
4. For use with the toilet and for other activities. The seat can be changed.
5. For the aged. The backrest is higher than usual, and the depth of the seat is shorter. There are handles for ease in standing. The wider armrests can be used as side-tables.

The type of chair shown in Photo 14 is designed to fit the individual measurements of a child's body. It has adjustable backrests, armrests, footplates, and seats to change heights or angles according to the need or disability.

When ordering the chair, the intended use should be considered, as well as the location of use, the size of the body, and the physical condition of the user.

However, since it is difficult to completely relax in a sitting position, extended use of this chair at one time should be avoided.



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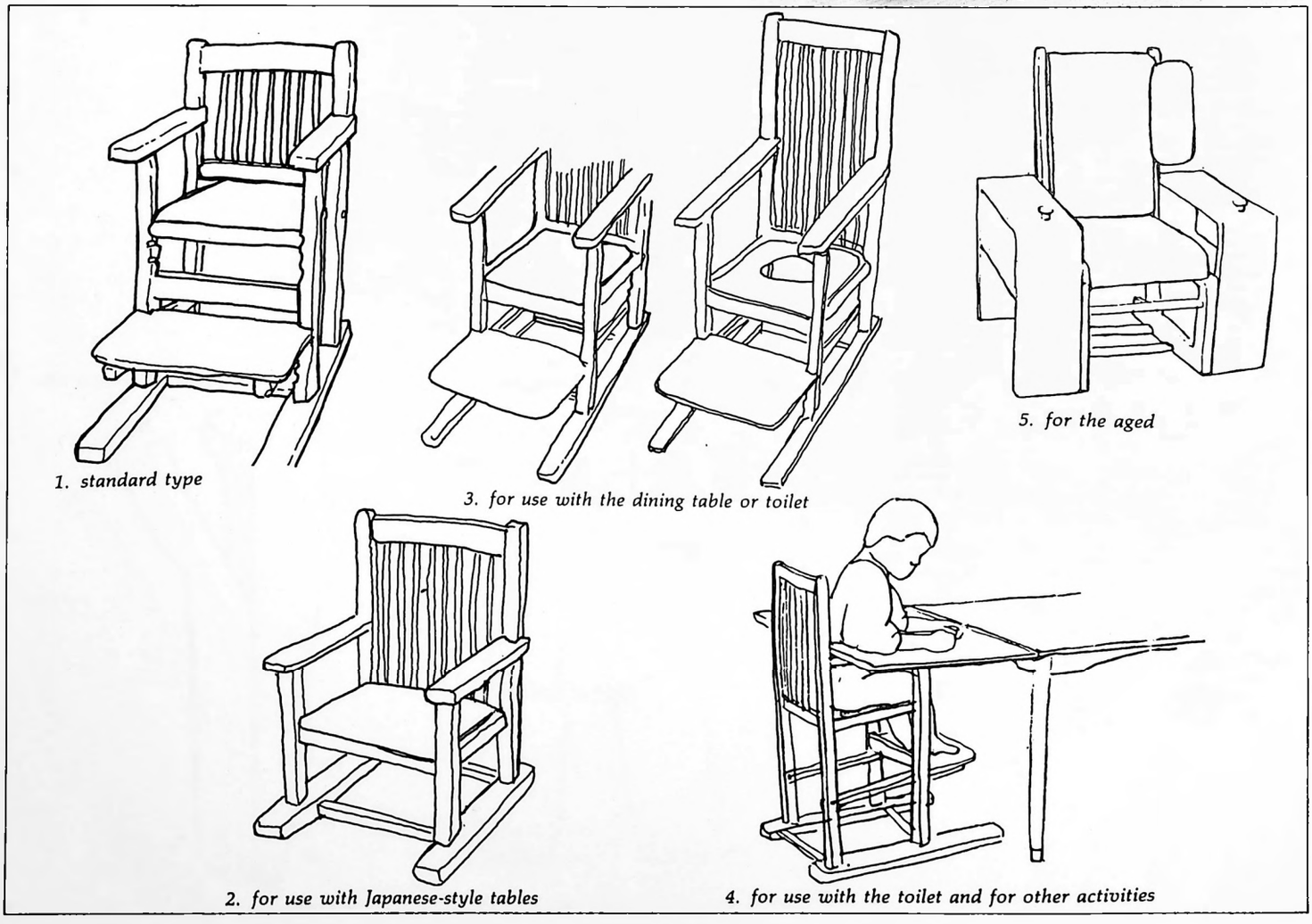


1. standard type

3. for use with the dining table or toilet

5. for the aged

2. for use with Japanese-style tables

4. for use with the toilet and for other activities

ENVIRONMENTAL CONTROL SYSTEM

Most people who are severely disabled are also strongly motivated to perform as many of their routine daily activities as possible by themselves, without assistance from others. To help meet this desire, medical workers and engineers in the rehabilitation field have been enthusiastically exploring many possibilities.

One that seems to have great potential is the Environmental Control System (ECS). This system aims at enabling those with severe physical disabilities to perform their routine daily activities with the aid of environmental control equipment. The ECS is shown in Figure 1. There are four units:

1. Sensor. This helps to utilize any slight remaining physical capability such as neck movements, the expiration of breath, the voice, or any others, for electric signals.
2. Circuit. For managing the signals.
3. Monitoring device. For managing and checking the signals.
4. Environmental equipment. Electric beds, lights, curtains, page turners, telephones, TV sets, and others.

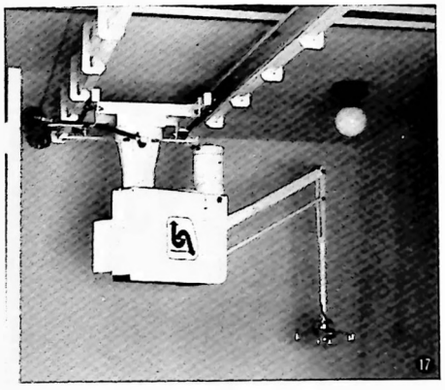
When the main switch is turned on, the possibilities for use are indicated. The desired one is selected by means of a signal, and the circuit to perform the particular function is alerted. Progress can be followed on a TV monitor (*Photo 15*).

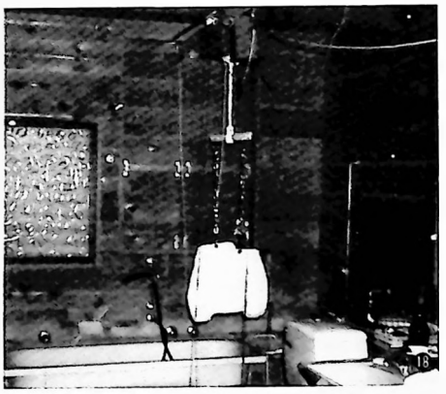
An electric typewriter for typing Japanese characters by manipulating neck movements and expiration is now being developed (*Photo 16*).

HOISTS

The need for convenient hoists for home use has been increasing. They are needed for institutional use as well. But the hoists currently available on the market have disadvantages as well as advantages. Three types will be considered here:

1. Hoist for taking a bath (*Photo 17*)
   Low in cost, but difficult to manipulate.
2. Ceiling-hung hoist (*Photo 18*)
   Easy to operate, but noisy and expensive.
3. "Hosman Ace" hoist (*Photo 19*)
   Easy to operate, portable, and safe; moves up and down by air pressure.





Organizations which Exhibit and/or Provide Information on Equipment for the Handicapped

Company	Products and Services	Address	Telephone
Japan Abilities Association	Information on self-help devices and nursing equipment	16-14 Yoyogi 5-chome, Shibuya-ku, Tokyo 151	03-460-2341
Rehabilitation Instruments Developments Center	Information on devices for the disabled	9F, 28th Mori Bldg. 16-13 Nishiazabu 4-chome, Minato-ku, Tokyo 107	03-498-0255
Japan Sun Information Center	Introduction, exhibition and consultation on self-help devices	302 Urban Bldg. 2-23 Shinjuku 4-chome, Shinjuku-ku, Tokyo 160	03-354-6219
Seibu Department Store (Ikebukuro branch) Consultation Corner for senior citizens	Exhibition, consultation, and sale of devices for senior citizens	1-28 Minamiikebukuro, Toshima-ku, Tokyo 171	03-981-0111
Tobu Department Store (Ikebukuro branch) Nursing Equipment Corner	Exhibition and sale of nursing equipment	1-1 Nishiikebukuro, Toshima-ku, Tokyo 171	03-981-2211
Special clothes designing room for the handicapped/Tokyo Metropolitan Prosthetic and Orthotic Research Institute	Information on clothing for the handicapped	43 Toyamacho, Shinjuku-ku, Tokyo 162	03-203-6141
Japan Sun Industries	Development and exhibition of equipment for the handicapped	Kamegawa, Beppu-shi, Oita 874-01	0977-66-0277

Publications

Title	Author	Publisher	Telephone
Self-Help Devices: the World of Functional Disability and Its Tools	Tadao Koga and Takeo Hara	Ishiyaku Publishers Inc.	03-944-3131
Rehabilitation Clinics Series Six: Clothing Design for the Physically Handicapped	Yaeko Kashiki and others	Ishiyaku Publishers Inc.	03-944-3131
Housing for the Physically Handicapped in a City Environment	Kan Nomura and others	Ishiyaku Publishers Inc.	03-944-3131
"Rehabilitation Notes"		Japan Abilities Association	03-460-2341
"We Are Human Beings"		Japan Sun Information Center	03-354-6219
Study of the Development of Devices for the Handicapped	Sadaichiro Sakamoto	Rehabilitative Instruments Developments Center	03-498-0255
"Gadget for Rehabilitation" (Newsletter for Paraplegics)	Translated and edited by Rehabilitation Gazette, editorial committee	Tokyo Colony	03-953-3541
Handbook for the Social Welfare System		National Rehabilitation Center for Disabled Children	03-974-2146
Planning Kitchens for Handicapped Homemakers	Wheeler, V.H.; translated and edited by Kumiko Terayama	Japan Abilities Association	03-460-2341
For the Care of Clinical Joint Rheumatism	Edited by Occupation Therapy Department, School of Rehabilitation, Tokyo National Chest Hospital	Takeda Chemical Industry Co. Ltd.	06-204-2395

Companies which Manufacture and/or Deal with Equipment for the Handicapped

Company	Items	Address	Telephone
Inabata Preston Co. Ltd.	Various aids for the disabled	2-6 Nihonbashi, Honcho, Chuo-ku Tokyo 103	03-667-1111
Yaesu Rihabili Co. Ltd.	Various aids for the disabled	6-13 Nihonbashi, Kayabacho 3-chome, Chuo-ku, Tokyo 103	03-666-7911
Japan Abilities Co. Ltd.	Various aids for the disabled	16-4 Yoyogi 5-chome, Shibuya-ku, Tokyo 151	03-460-2341
Sakai Medical Co. Ltd.	Various aids for the disabled	31-7 Hongo 3-chome, Bunkyo-ku, Tokyo 113	03-814-0411
Pacific Supply Co. Ltd.	Various aids for the disabled	3-17 Kameido 2-chome, Koto-ku, Tokyo 136	03-684-5354
Takeda Chemical Industry Co. Ltd.	Various aids for the disabled	12-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103	03-278-2111
Kimura Bed Mfg. Co. Ltd.	Hospital beds	14-5 Higashisuna 7-chome, Koto-ku, Tokyo 136	03-648-1111
Takara Belmont Industry Co. Ltd.	Hospital beds	1-19 Akasaka 7-chome, Minato-ku, Tokyo 107	03-403-0311
Tokyo Eizai Laboratory Co. Ltd.	Urinal devices	43-4 Hongo 3-chome, Bunkyo-ku, Tokyo 113	03-815-6645
Suzuki Motor Co. Ltd.	Motorized wheelchair	300 Kamimura, Hamana-gun, Shizuoka-ken 432-91	0534-47-4740
Toto Co. Ltd.	Toilet, bath	1 Shiba Toranomon, Minato-ku, Tokyo 105	03-503-6311
Ina Seito Co. Ltd.	Toilet, bath	9-8 Hachobori 2-chome, Chuo-ku, Tokyo 104	03-551-6371
Pigeon Co. Ltd.	Bath for the bedridden	5-1 Kanda Toyamacho, Chiyoda-ku, Tokyo 101	03-252-4111
Caproll Co. Ltd.	Mattresses for the bedridden	1-18 Uchisaiwaicho 2-chome, Chiyoda-ku, Tokyo 100	03-903-1191
Sanwa Kaken Industry Co. Ltd.	Mattresses for the bedridden	1906 Ota Yao-shi, Osaka 561	0729-49-2581
Rion Co. Ltd.	Hearing aids	2-7 Yoyogi, Shibuya-ku, Tokyo 151	03-379-3251
Fuji Mechanical Apparatus Co. Ltd.	Alarm-clock for the deaf	1 Sankocho, Shinjuku-ku, Tokyo 160	03-208-9911
Aichi Electric Mfg. Co. Ltd.	Electric can-opener	7-1 Nishishinjuku 1-chome, Shinjuku-ku, Tokyo 160	03-343-5591
Fuji Auto Inc.	Automatic control devices for the physically handicapped	5-1 Sekinocho 1-chome, Koganei-shi, Tokyo 184	0422-84-6090